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Salishan Lodge, Gleneden Beach, Ore.

April, 1972

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FOREST DEVELOPMENT PRACTICES AND THEIR RELATIONSHIP TO THE ALLOWABLE CUT

The primary objective of this paper is to promote an understanding of the concepts dealing with the relationship of forest development practices to harvest levels. Whereas the workshop provided an opportunity for audio-visual aids and involvement by the attendees in the form of problem solving and dialogue, this effort must of necessity take a slightly different and abbreviated form.

There are at least two approaches to hopefully meet the stated objective. One approach is to first describe the relationship between the development practices and harvest levels in terms of the total forest and then apply it towards the individual acre. The second approach is to start with the acre and then work towards the forest. Normally the latter approach is taken; however to attempt to explain the relationship of planting an acre of land one year and the harvest level that same year is difficult at best. This is because we traditionally think of that acre as being harvested eighty or ninety years in the future. To circumvent what might be a mental block in this regard, this paper shall proceed along the lines of the first approach; that is, by starting with the forest.

The concepts to be explored can be applied to any forest development practice be it planting, seeding, precommercial thinning, genetics, etc. These practices and others are most often directed towards

increasing timber growth. One of the obvious benefits is an increase of wood products flowing to the consumer. There are other benefits in the form of non-timber values and uses which may also result; however this paper addresses itself only to the timber growth aspect.

In order to relate these practices to the flow of goods to the consumer, it is important to know what the Bureau's policy is in regards to regulating that flow. The policy specifies that the harvest level (allowable cut) must be based on a principle of sustained yield which requires planning for a high level and undiminishing flow of wood over time. This is not to say that the concepts to be set forth are unique to this regulatory system. It is cited only for the purpose of relating these concepts to Bureau policy.

Having defined the two ingredients, forest development practices and harvesting levels, we can proceed to explore their relationship.

The use of a simple and well known allowable cut formula may serve as a helpful introduction to the subject matter. It is:

$$\text{Annual Allowable Cut} = \frac{\text{Mature volume}}{\text{Rotation}} + \text{Average Annual Growth}$$

The mature volume and rotation can be viewed as relatively fixed; at least for the sake of this example. However, the growth component is a function of the intensity of management to which the forest is to be subjected over the rotation period. The solution to the problem would vary with the assumptions or forecasts made relative to the growth over this period. These growth assumptions, would,

in turn, depend upon such things as the forest development practices to be carried out. Consequently, the increase in growth resulting from a given practice is reflected in the growth value in the equation and in turn the allowable cut level. Since the only time frame is the rotation, the increased growth is equally distributed over the rotation period. In other words, the impact on the allowable cut is as great in the first year of the rotation period as the last year. This, then, illustrates the basic concept of how a practice can have a "direct impact" on the harvest level. While a little apart from the primary purpose of this paper, the foregoing example also meets a sub-objective stated as follows:

> "To dispel the myth held by many foresters that within rather broad institutional constraints there can be one and only one allowable cut for a given forest. To the contrary, a range of allowable cut alternatives exists, whose magnitude depends upon the assumptions and actions to be made or exerted on the forest in regards to timber production activities as well as those related to non-timber values and uses."

Assuming that the reader understands this extremely oversimplified example, we shall proceed from the abstract to the recently developed Western Oregon Allowable Cut Plan. Although a computerized simulation model was used to generate the allowable cuts in this plan, the relationship between the development practices and

the harvest levels is essentially the same as shown earlier by the formula. One of the major differences between the two methods is that the model projects the forest many rotations into the future to insure no planned decrease while the traditional formula methods deal only with one rotation.

Before proceeding further, it may be desirable to first state a truism of forest management which bears on the subject at hand. It is:

> "In a regulated forest (fairly even distribution of age class acreages) the annual cut equals the annual growth."

As an aside, it is interesting to note that the present allowable cut is approximately three times greater than the annual growth. Of course the present forest is far removed from a regulated state. Nonetheless, the significance of the aforementioned tenet is that under the Bureau's policy of sustained yield, the future potential growth of the forest fixes the maximum amount of volume which can be harvested now. That maximum cannot be exceeded now for it would then require a reduction sometime in the future down to the potential annual growth level. Perhaps some actual data from the Western Oregon Plan will clarify this point.

One of the alternatives examined in the development of the Plan was a minimal level of management which included final harvest

cutting and reforestation only. Under this intensity of management the potential annual growth of the future regulated forest was 1.1 billion bd. ft.[1/] Consequently, it represented the maximum harvest level both now and in the future. However, in order to determine how much of this potential could be harvested now it was necessary to make 13 runs (one for each management area) by use of the forest simulation model. The sum of these runs indicated that the full potential or 1.1 billion bd. ft. could be harvested beginning in the first decade and sustained indefinitely. Although the present growth of the forest is significantly less than the potential, the presence of a surplus of mature timber permitted harvesting the potential now (about 55% of the forest is in stands 85 years in age and above).

Another alternative, which subsequently became the adopted Plan, included such practices as precommercial thinning followed by commercial thinning, forest genetics, mortality salvage, intensive reforestation and stand conversion. The inclusion of these practices increased the potential annual growth of the forest to about 1.5 billion bd. ft. In order to determine how much could be harvested in the first decade without having any planned future decrease, it was again necessary to make 13 runs through the simulation model. The sum of these runs indicated that about 1.4 billion bd. ft. or 90% of the potential could be harvested annually in the first decade.

[1/] All volumes reported are Int. 1/8".

In other words, of the 400 million increase in potential annual growth resulting from the stated intensive practices, approximately 300 million could be harvested annually in the first decade. Here again, the availability of merchantable timber, largely overmature, in conjunction with the increased yields from the practices themselves, resulted in an immediate or "direct impact" on the allowable cut.

As a matter of general information the contribution of the individual practices to the 300 million bd. ft. increase was approximately as follows:

Precommercial-commercial thinning	55%
Forest genetics	25%
Mortality salvage	12%
Intensive reforestation	6%
Stand conversion	2%

With the exception of commercial thinning, the impact of these practices took the form of increased final harvest cutting of overmature timber. It should be pointed out that normal reforestation practices were included in the base level alternative and therefore no impact was measured. Had they been excluded from the base level and then subsequently included and their impact quantified, they would have headed the list in terms of significance.

Perhaps with this background, we can now proceed to the individual acre and briefly discuss it in terms of development practices and harvest levels. Normally we develop growth and yield data for the individual acre and subject it to economic and other analyses prior to expanding it to the forest. At any rate, the following example may assist in explaining the relationship. Let's assume that by planting an acre with genetically improved stock instead of normal stock, the yield at age 80 (expected harvest age) will be increased from 64,000 bd. ft. to 80,000 bd. ft. The increase of 16,000 bd. ft. prorated over the 80-year period indicates an increase of 200 bd. ft./acre./yr. Consequently, the annual harvest level can be increased by that amount starting now, assuming merchantable timber is available, on the expectation that 80 years from now the 80,000 bd. ft. will be available for harvest. Expanded to the forest, the impact on the annual harvest level can be readily estimated by multiplying the 200 bd.ft./acr./yr. by the number of acres to be planted with genetically improved stock. However, in order to determine to what extent the total impact can be absorbed by the existing merchantable timber in the forest, it is necessary to utilize the forest model as was discussed earlier.

Therefore, in summary, the relationship between the forest development practice and the harvest level is dependent upon:

- the difference in growth between doing the practice and not doing the practice
- the availability of merchantable timber to absorb that difference

Perhaps the whole relationship can most simply be illustrated by the fact that at the same time some trees are planted in one part of the forest other trees can be harvested in a different part of the forest on the premise that the planted seedlings will provide comparable yields sometime in the future.

GUIDELINES FOR THE EXPENDITURE OF FUNDS PROGRAMMED FOR FOREST DEVELOPMENT [1]

INTRODUCTION

About a year ago all of the western Oregon districts received a copy of "Guidelines for Investments in Intensive Forest Management in Western Oregon". It is my purpose, for the next few moments to: (1) put these guides into perspective. What do they mean? How useful are they?; (2) Explain a few of the assumptions and procedures that went into their development.

The "guides" were originally developed as part of the new allowable cut plan for western Oregon. The thinking went something like this: What we need is a way of ranking investment opportunities so that we can put together alternative allowable cut plans reflecting different intensities of management; and also enable us to screen-out practices that don't appear to be good investments. As it turned out, we really only had two alternative levels of management--nothing and everything. For this purpose, the ranking was not a very meaningful exercise. The second purpose--that of screening out poor investments--was used; however, nearly all of the investment opportunities submitted by the districts appeared to be reasonably good investments, i.e., the screen left nearly everything into the allowable cut plan. It was felt that perhaps the results of this effort might be helpful to the districts in determining where to invest their forest development money. Thus, the rankings by practice were lifted from the allowable cut study and put into this set of guidelines.

THE GUIDELINES IN PERSPECTIVE

Now let's take a few moments to put these guidelines in perspective. First, they are just what their name implies--"guidelines". They are not intended to be hard-and-fast rules to be followed blindly. Second, they are of most value when funds are the primary factor limiting forest development activity. If you have plenty of money, but little planting stock or manpower to carry out a reforestation program, for example, then the guides are of little value. Their whole purpose is an attempt to maximize the return in stumpage terms to dollars invested. They in no way reflect other concerns--social, environmental or political--that may be of over-riding significance. For example, I doubt if these guides would have had much influence in deciding whether or not the Pass Creek sale would get reforested, no matter how bad an investment it might have been.

Another way of looking at the usefulness of the guides is to consider a simplified version of the Bureau's hierarchy of decision. (Figure 1)

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[1] Talk given at the Western Oregon Forest Development Workshop, April 24-26, 1972 - Salishan Lodge

Generally speaking, decisions in the upper level of the hierarchy are more complex and have little use for these kind of guidelines. The goals that guide these decisions are often broad and vague. The alternatives, inputs and outputs, are not always clearly defined, and many factors--political, social and environmental--are important to the decision. Once these kinds of decisions have been made, however, the less complex decisions remaining can, I believe, be aided by simple financial analysis.

To illustrate this, consider the case of the decision of where to apply precommercial thinning. Before we can get to this decision, someone has to decide that intensive forest management is a good thing. Better, perhaps than more intensive range management or more recreation sites. Then, it is necessary to decide what intensive management practices are worthwhile and the amount of resources that each should be allocated. This brings us to our precommercial thinning location decision. Someone has decided that intensive forest management is worthwhile; that precommercial thinning is a good thing, and that the Turnerville District should get $22,000 to do the job. The only question remaining is, "Which site do we precommercially thin in Turnerville?" Note that, relative to the higher level decisions, this is somewhat simpler. Goals are clearer, alternatives are clearly defined--9 sites; the inputs are defined--money and manpower, and the output is singular--more wood. The major constraining force is the size of the budget. In a case such as this, simple economic guidelines can provide important help to the decision maker--they may even lead directly to a decision. Perhaps not the best decision--but only the future can judge. Enough theorizing, my point is that I feel that these guidelines can be of some help in setting priorities for forest development projects, if they are used with some discretion.

THE GUIDELINES

Now let's take a more detailed look at the guidelines and some of their more important characteristics. The next transparency (Figure 2) shows the steps that were included in the development of the guides:

1. A review of the literature was made on each of the practices--thinning, fertilization, etc.--that was being considered. Basically, this review was made for two reasons.

    a. To determine the biological response that might be expected from the practice, and

    b. To see what factors were most important to the response so that stand classes within each practice could be developed.

2. Generally, a range of biological response was found and we ended up making an estimate somewhere near the middle or lower part of the range.

3. In nearly all instances, site and age were used to develop the stand classes. For example, some 9 site and age classes were used for precommercial thinning. In addition, two thinning methods--chemical and mechanical--were recognized in the analysis. This resulted in a total 14 stand classes to be analyzed for precommercial thinning.

4. The next step was to estimate the allowable cut impact for each of the stand classes. There were over 100 stand classes for all practices. The use of the allowable cut impact as a measure of benefit is the most significant departure from standard investment analysis and I want to spend some time later covering this procedure in more detail.

5. The costs and stumpage values were applied and the benefits and costs for each stand class determined.

6. Finally, financial criteria were computed for each stand class: benefit/cost ratio, Present Net Worth, and Internal Rate of Return.

Now, let's back up and take a look at the allowable cut impact. Perhaps the best way to do this is through a simple example. Suppose we have the following situation:

a) We want to convert a brush field to a Douglas-fir stand.

b) The brush field is located on Site 3 Douglas-fir land with a potential yield at age 80 of about 70 MBF/acre.

c) We predict that the stumpage value in the future will be about $50/MBF.

d) The cost of the project will run about $50/acre.

The conventional way of analyzing such an investment would go something like the following (Figure 3): We would multiply the expected yield at age 80 times the stumpage value yielding a return in 80 years of about $3500/acre. Then, we would discount the yield to the present with some rate of interest--say 5½%--and then compare it with the cost. And it usually turned out to look pretty bad. As in this example, the B/C ratio is only about .3. The present worth of the costs exceed the present worth of the benefits by over $100.

But, never fear, with a little economic rain-dancing, we can turn this project into a real winner!! Seriously, there is another way of looking at this investment that I believe, is honest and ethical. Rather than considering the acre in this project as a separate entity, let's consider them as part of a forest under sustained yield management. When we convert this area from brush to Douglas-fir, we are essentially adding acres to our forest and, as a result, we are increasing the growth of our forest. It follows that anything that increases the growth will add to the sustainable harvest, not in 80 years, but now! This concept is sometimes as "Direct Impact" and it is the general principle we followed in the development of the guides.

Stated in general terms, "Direct Impact" goes something like this:

> "In a forest subject to sustained yield regulation, a forest development project that accelerates the growth of immature stands or adds acreage to the commercial forest base will increase the rate at which mature stands can be harvested. The benefits of such a project may begin as soon as the adjustment in the allowable cut is made. They take the form of an annual flow of wood over time."

Let's apply this concept to our simplified example and see how it works. Our picture now looks something like the following (Figure 4):

First we estimate the impact on the allowable cut to be equal to the annual increment, or 70 MBF/80 years = .875 MBF/acre/year. Applying our $50/MBF stumpage value, we get an annual return of about $44/year. If we discount this annual flow over the 80-year period to the present using the same 5½% interest rate, we get a present value of $780.00. Our B/C ratio becomes 5.2 rather than 0.3.

Note that this technique assumes a sufficient supply of harvest age timber to support the increased harvest. As it turns out, this assumption is not too hazardous in our western Oregon forests.

HIERARCHY of DECISIONS

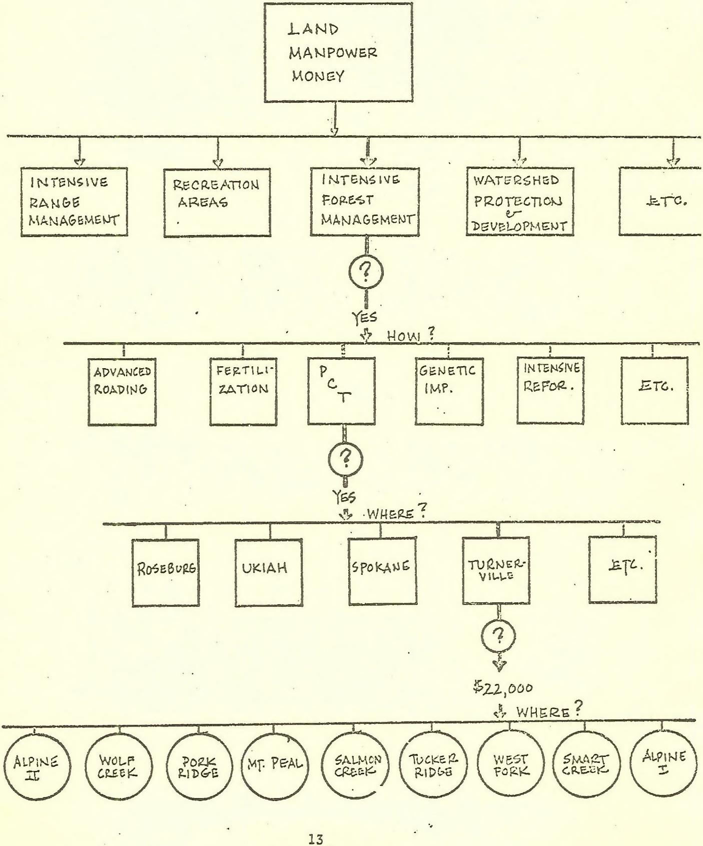


FIGURE 2

DEVELOPMENT OF GUIDELINES

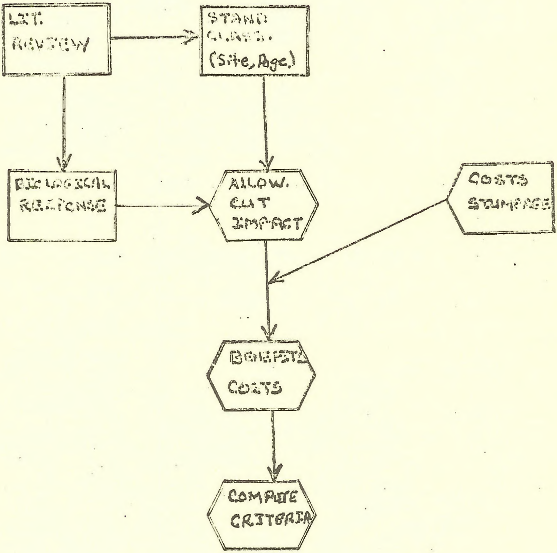
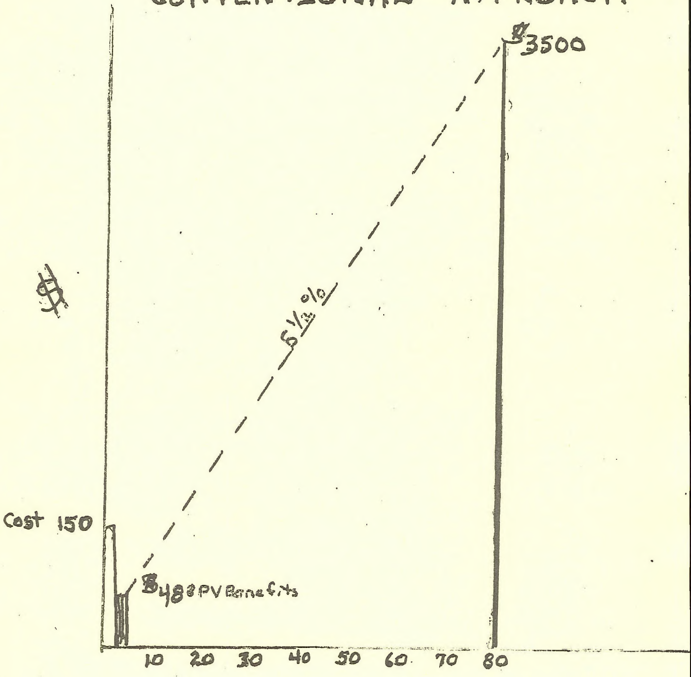


FIGURE 3

CONVENTIONAL APPROACH

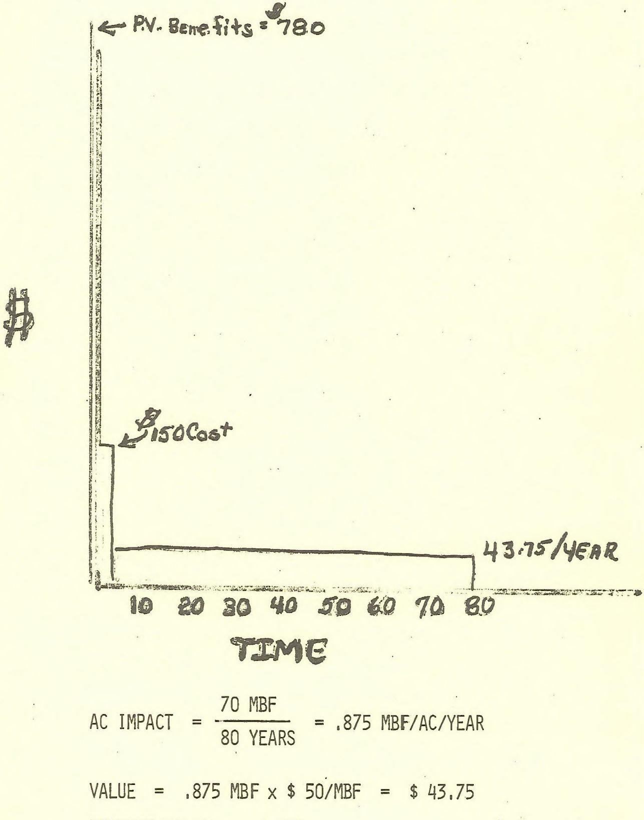


VALUE OF BENEFITS AT 80 YEARS = 70 MBF X $50/MBF = $ 3500

DISCOUNTED VALUE = $ 48.30

$$B/C = \frac{48}{150} = 0.3$$

DIRECT IMPACT APPROACH



$$\text{AC IMPACT} = \frac{70 \text{ MBF}}{80 \text{ YEARS}} = .875 \text{ MBF/AC/YEAR}$$

$$\text{VALUE} = .875 \text{ MBF} \times \$\,50\text{/MBF} = \$\,43.75$$

$$\text{PRESENT VALUE} = \$\,780$$

$$\text{B/C} = \frac{780}{150} = \underline{\underline{5.2}}$$

REFORESTATION PLANNING AS A PART OF TIMBER SALE PLANNING

CES FEENEY

A discussion of this panel's subject, "Reforestation Planning as a Part of Timber Sale Planning," I think, is not only overdue, but urgent. Our approach to planning these two operations in the past has been just that -- two separate operations. The timber sale planner, in most cases, developed his plans without any serious concern for reforesting the timber sale tracts. There was no attempt to anticipate the problems which would be faced by the Rehab Forester. This has been going on since about 1957 so it would be wrong to suggest that we have an impossible situation. On the other hand, it would also be wrong to suggest that there is no room for improvement.

I can see some rather obvious signs that there is also an element of urgency about this problem. As an example, let's look at the "Western Oregon District Organization Study" of November 1970. One of the major findings was "a need to improve the planning efforts in the Districts." This report pointed out that there is generally a split between the planning responsibilities of the Timber Manager and those of the Resource Manager. It was further said that planning was relegated to a low priority because of the pressures of production work, and the absence of a well defined responsibility.

This report really didn't state specifically why there was a need to improve our planning efforts. However, it wouldn't take a Rehab Forester long to cite many examples where coordinated planning efforts between the people in timber sales and the people in reforestation could have prevented, or at least alleviated reforestation headaches and impossibilities. How many of us could provide examples of inheriting logged-off timber sales with unburned slash, excessive brush, shadeless severe south aspects, or sidecast materials running all the way to a creek? I doubt if there is anyone here today who could say he han't been confronted with some of these conditions and that cooperative planning wouldn't have ameliorated the situations.

Additional evidence of the urgency of this planning problem comes to us from the Senate Committee on Interior and Insular Affairs. Its subcommittee on Public Lands has held hearings and prepared a report entitled "Clearcutting on Federal Timberlands." Among other things, the report states that: "Clearcutting should not be used as a cutting method on Federal land areas where:

b. There is no assurance that the area can be adequately restocked within five years after harvest

d. The method is preferred only because it will give the greatest dollar return or the greatest unit output."

Now here we have a committee back in the United States Senate which has prepared harvesting guidelines for the clearcutting of Federal timber.

And furthermore, it is being quite specific about the reforestation, and economics of clearcut areas.

I think there is a message here for us, and in my mind it boils down to this: Timber sale planning and reforestation planning must be blended together in a much more intensive fashion than has been the case in the past.

After all, our forestry literature looks upon final harvest cutting systems as methods of reforestation. Even in the current public controversy over clearcutting, the proponents of clearcutting in Douglas-fir are justifying its use because it closely resembles the system nature uses to reforest the species. And, of course, the opponents take the position that clearcutting is simply a system for making a "fast buck." As we all know, both camps have a point. Someone once said something to the effect that good silviculture has to be good economics. To me, all this points up an opportunity for us to combine timber sale planning with reforestation planning. I'm sure that the end result will be a better land management operation.

In getting down to the specifics of how the current relationship between timber sales and reforestation planning can be improved I would suggest a couple of ways to accomplish the mission. First, a "reforestation plan" should be made a requirement of the timber sale

planning process. That is, the plan for every timber sale tract would be accompanied by a "reforestation plan."

I think BLM's minerals management program is ahead of us with this concept. For example, when a rock pit is to be opened for use, not only is a mining plan required, but also a plan for reclamation. It seems to me that we should do likewise. If there is to be a final harvest cut then there should be a "reforestation plan" as well as a timber sale plan.

What would be some of the questions to be answered in a "reforestation plan?" I would suggest the following as a partial list:

1. Can the area be reforested?
2. Will there be an adequate supply of seed or planting stock after logging?
3. Are there likely to be any problems caused by plant competition or diseases, and how can we cope with them?
4. Is there any indication of animal problems developing, and are the solutions ecologically and economically acceptable?
5. Will slash be a serious deterrent to reforestation?
6. Will there be a reasonable level of soil moisture available to seedlings after the area is logged?
7. Will there be an acceptable seedbed condition after logging?
8. What options are available for genetic improvement?

I have posed quite a few questions here, and believe me, it's not to impress anyone with the complexity of the reforestation problem. Rather, it's an attempt to emphasize the many opportunities for the timber sales function to complement the reforestation function.

Now the writing of a "reforestation plan" might, in itself, be enough to improve the timber sale-reforestation planning relationship, but then again it just might not. Over the years I have seen more than one planning system consume man-months and sometimes man-years only to have the end product left on a shelf - unused - and eventually laid to rest in the "circular file." So, I look upon this suggested "reforestation plan" as only a beginning. It must have reinforcement from another area.

The area of reinforcement which I have in mind is related to the delegation of responsibility. I would suggest (1) that the man responsible for timber sale planning also be assigned the responsibility of reforestation planning, and (2) that the timber sale contract administrator also be responsible for the administration of reforestation contracts.

Thus, the fellow who would plan a logging show on a severe south aspect will have to live with the problem of planning for the reforestation of such a site. And the contract administrator who would accept a poor job of slash disposal will then be faced with the problem of convincing planters to go into and through slash to plant seedlings.

This, I think, would be a most effective way of improving the coordination of timber sales and reforestation planning.

So, to summarize, I think the current relationship between timber sale and reforestation planning is unsatisfactory, and it is urgent that we move to improve the situation. Furthermore, I suggest the situation can be improved by (1) requiring a "reforestation plan" for every timber sale tract, and (2) by assigning reforestation responsibilities to the planners and administrators of timber sales.

One final word. This discussion has been confined to the timber sale-reforestation planning relationship because that is the assigned topic. I believe, however, that other natural resource disciplines should be actively involved in this planning process.

REFORESTATION PLANNING AS A PART OF TIMBER SALE PLANNING

The resource group in Eugene is responsible for the long range plans beyond the 5 year timber sale plan. This can be one of our chief means to influence the timber groups in the manner in which they harvest timber and thus influence reforestation. In Eugene we are primarily a high lead district and primarily an uphill high lead district.

The resource group does all of the road location except for "one shot" spurs. By this means the type and season of logging can be influenced by the resource group. The timber managers do have a say in the final development and location but they at least have to give some thought as to why they do not agree with the development decisions of the resource group.

This is not always the answer though. Ernie asked, "What involvement does the Resource Group have in Timber Sales and Road Plans?" I have mentioned the road location function as though this was an asset to reforestation. Let me say that the engineers are not always the easiest breed to convince when good reforestation practices conflict with their ideas of a good road. The big benefit here is that the reforestation man and the engineer both work in the same resource group for the same supervisor. At times it may not seem like a benefit, but this is nothing in comparison to trying to work between groups and different supervisors.

As for the resource groups influence on timber sales, it is quite small in the long range planning end. Critical areas can be identified, methods of logging an area recommended and season and sequence of logging can be placed in the planning folder.

But with any plan dreaming many years in the future, personnel change, ideas change and social values are changing we find that most of these earlier long range planning efforts are no longer useable due to current social values.

QUESTION

Does the district have a uniform policy to see that reforestation is assured prior to harvest?

ANSWER

No, but for the past several years there is more thought and consideration being given to this problem. During the preliminary review of the timber sale plan in late December, the rehab man for the area and the staff rehab are a part of the review team. This doesn't really give a lot of time for input prior to finalizing the plans but it is a start. We could get more involved in the 5 year plan but this plan is in very preliminary form due to a lack of planning time in the timber groups whose responsibility it is to maintain the plan.

Really, we in Eugene feel quite fortunate that we do not have the temperature - drought problems of our southern neighbors nor the brush problems of the Coos Bay district.

Probably an imput into the annual timber sale review is all that we need at this time because of the relative ease of reforestation on our district.

IMPROVEMENTS NEEDED

We still need a better understanding of our soils. We have come a

long way in recognizing soils as a factor but we are far from having all of the answers. We need more consideration for our position and needs in post sale administration. While a rehab man is commonly involved in the inspection of an area for slash release, the tendency today is not to burn anything but the heaviest concentrations. This leaves us without a place to put our trees. With very few areas underdeveloped our patterns are pretty well set for our first harvest. With more emphasis on aesthetically pleasing shapes to our clearcuts and smaller clearcuts, we may be making a big step toward more successful natural reforestation in our second growth stands.

Forest Development Workshop - April 24, 1972
Gleneden Beach, Oregon

Panel Discussion: Reforestation as a Part of Timber Sale Planning

William McLaughlin
Resource Manager, South Area
Medford, Oregon

Reforestation planning as related to Timber Sale planning on the Medford District has undergone some significant changes since we have been actively engaged in reforestation.

In the late 1950's through the mid 1960's we were pretty much on a staggered setting - clearcut system of timber sales. In this era we were depending on the reforestation foresters to accomplish the planting or seeding of a pretty constant acreage of clearcuts each year. The rehab man could pretty well forecast his needs for number of trees, by species, zone and elevation and arrive at a pretty reasonable planting or seeding program.

About the only coordination necessary between sale and rehab planning, was to pass on information on what sales would be ready so that rehab could prepare his contracts and schedule the necessary and proper planting stock.

This system is still used to some extent in the northern part of the Medford District on sites where clearcutting is the best silvicultural prescription and where reforestation efforts have a reasonable chance of success.

Unfortunately, over most of the District the system of clearcuts resulted most usually, in complete or partial failure from the rehabilitation standpoint. We discovered that the combination of hot dry summer temperatures, creation of frost pockets, competing grass and brush and various animals was resulting in failure after failure. We were adding to the nonstocked areas each year through addition of new clearcuts and continued failure of the older units to become established. This is generally the case on BLM, USFS and private lands. As a result of the failure both Federal Agencies and some of the more progressive private companies have shifted nearly 100% to various partial cutting systems. For lack of a better term and to shortstop various discussions of whether it should be termed selective cutting, partial cutting or shelterwood, let's call it continous canopy forest management.

Under the present systems of cutting it is assumed, generally, that the stands will be restocked naturally and 100% productive by the time the final harvest cut is made. For the sake of simplicity, cutting is accomplished in three stages with some natural seeding resulting following the first cut, additional natural seeding following the second and the last cut, or harvest cut, made at such time as the understory is fully established. We are talking in the generalized model of a 30 year time period for all of this to take place.

Timber sale planning in this method of harvest is, therefore, really controlled by reforestation considerations. Reforestation and continuation of a commercial forest stand effectively is the prime consideration in timber sale planning.

If there are no other constraints to the type of harvest, such as the necessity to leave buffer strips or scenic zones, then reforestation considerations, and plans pretty well dictate whether a particular stand will be clearcut or partial cut. Therefore, the timber sale planning and reforestation planning are totally interlocked and each is dependent on the other.

At present, in the Medford District, the majority of the planting effort is directed to the retreatment of previous reforestation failures. Reforestation on the few new clearcuts are handled and planned for in the same way as they have been in the past, with only the reforestation planning problems of obtaining seed and planting three to four years before the time it may be needed to reforest a clearcut contract which may be cut anytime within a 30 month period, and which may or may not have the slash burned and released for who knows how long. Reforestation planners have been living with this situation for years, so nothing is unusual.

Reforestation planning is handled on a pipeline basis on the old failures, and by frequent examination of the old units the rehab plans can be pretty firmly set barring any suddenly imposed constraints to land treatment.

All of this may sound as if the rehab men are soon to be out of a job in the near future if all the old dogs get either restocked through their efforts or that it becomes obvious, on some units, that they are impossible to reforest with present methods and constraints. It also, perhaps, appears that through continuous canopy management and the assumption that this system is always infalable, resulting in 100% stocking, that the rehab men will be put out to pasture or reassigned to another job. This is not necessarily so.

Being realists, it is safe to assume that continuous canopy management is going to result in a certain percentage of failures. These will have to be planned for and it will be necessary to coordinate planning for harvest cutting with rehab planning. I hope the proposed partial cut research studies and related development of a stocking survey system for partial cuts is accomplished in the near future. We need something more than empirical data and observations to arrive at both cutting and rehabilitation decisions. We have to develop stocking standards and criteria to tell the Timber Managers when to cut and the same criteria to tell the rehab men when it is necessary to interplant in the stand prior to the final harvest to assure that the stand is satisfactorily stocked before removing the overstory creating the climate which makes regeneration successful. This is a most important area, and at least for the Medford District, the most important research need we can identify and the most important need or component of our future rehabilitation plans.

A final rehab-timber sale planning consideration involves the allowable cut. In the Medford allowable cut, the only increase growth or production factor that is recognized within the planning period is, that which is attributed to genetic improvement. We identified no increase due to thinning opportunity, brush field conversion or other factor, only super trees.

While I have a certain amount of faith in the genetists and can visualize gains where plus trees are planted in clearcuts, I am somewhat pessimistic about the anticipated improvements from superior stock in a partial cutting system. We have to assume that we will be interplanting with superior stock prior to a final harvest. This expansive stock is first going to have to compete with the naturals and it is going to be subjected to logging damage during final harvest. If the stock is really superior it can be assumed that it will out- do the natives. If it doesn't out produce on a given site, then we will not be getting the anticipated gains. I hope it all works out but am pessimistic about the magnitude of the gains in a selective cutting situation.

I expect that all the Districts will be facing this same problem to greater or lesser magnitude. Even where you must selectively cut timber for other than silvicultural requirements the conversion to super trees is going to be a problem. It is going to be a problem involving joint planning of both timber and rehabilitation as the actions of one is going to have a direct bearing on the other function. Lets hope we have some definite guidelines to use when we reach this point.

Reforestation Planning as a Part of Timber Sale Planning

According to the cover memo to the agenda for this meeting, I am supposed to tell you what our district policies and procedures and problems are, related to Reforestation Planning as a part of Timber Sale Planning. I am reluctant to get into this topic under those ground rules. First, because I am not sure there is any district policy or procedure and second, because we have nothing but problems, and to talk about problems alone always makes me feel like a "cry baby."

We all know it is important to get our say into the sale plan. So far, in Coos Bay, we have not been too successful. The reforestation people sit in on all the sale plan reviews and make their comments which, if I judge the situation correctly, are promptly forgotten. After all, fellas, isn't it our job to plant trees and the rest of the district to cut them down?

In that light, I am reminded of a conversation I had with one of our Timber Managers a year or so ago. We were looking at a proposed sale tract. The timber was old, decadent, downright rotten, with a very heavy understory of hemlock and suppressed fir. Now you know that when the overstory is felled and removed, a heavy blanket of green slash will result together with dead, rotten logs and debris beaten into the ground.

I aked the Timber Manager what his plans were for preparing a seedbed or improving the planting conditions. He told me: (I wish I could remember his exact words, they were classic) "My job is to sell timber, your job is to plant trees and make them grow." You can see what he believes is important in his job--get the allowable cut out.

To me, the emphasis on getting out the cut and the attitude fostered by this emphasis is the biggest and potentially the most disastrous problem we have in Coos Bay.

This attitude spills over into everything we do. Special yarding techniques, leaving dead shade by girdling and poisoning hardwoods instead of cutting them down, piling and burning slash, leaving seed trees, making small clear cuts instead of big ones, all come under the heading of making extra work for the logger, the timber manager and the contract administrator. Besides, what do these items have to do with getting out the cut?

Problems we have, but specific policy or procedures for including planning for reforestation before harvest we do not have. Of course, I cannot condemn every Timber Beast for lack of concern. But looking at timber sale folders in general, not one word is said about reforestation until the last sentence which states: reforestation will be accomplished following logging.

I would like to add just one more thing to this discussion. It is my belief the Bureau has a vehicle which can and should provide for proper activity planning. That vehicle is the planning system. Planning for reforestation begins here at the U.R.A. level. If you will, at the inventory level. Overlays, maps and narrative statements showing competing conditions and problem areas are defined at the U.R.A. level, then programs outlined for solutions. Following this step comes the MFP. It is here that resolution of conflicting demands are met head on for decision making and it is in these decisions that guidance is provided, policy set and procedures suggested.

The challenge facing us is to use the planning system as it was intended as a decision making vehicle, not as a justification for the indiscriminate harvest of timber.

/S/ JWW
4/28/72

Jess McCabe

Reforestation Planning as a Part of Timber Sale Planning

In our district, when the timber manager is planning sales for approval, they have a form they fill out so they develop a comprehensive timber sale plan.

In filling out this form, they consider their units for reforestation and make recommendations on species to plant, brush problems, grass problems, and amount of slash they expect to be on the area. Under slash hazard, they list the degree of defect they anticipate which would give an idea of how much slash is going to be left on the area.

They also say how susceptible the soil is to fire damage.

The timber manager inspects the rehab cards of the adjacent clear cuts and talks over with the rehab people, problem areas in order to determine the stocking and the problems we had in the past to get these areas stocked.

After the sale had been sold and logged, the rehab people go out with the contract administrator along with the state man to determine the amount of slash to be burned, if any. This way the contract administrator can determine the amount of fire trail that he will require the purchaser to build.

We all know that, probably, in the near future we will be stopped from doing any slash burning. We will be faced with the problem of other ways of ridding the area of slash so we can find the ground to plant the trees.

We have two mini-groups in our district. These groups carry on all activities needed to properly manage the land and forest products in their assigned area.

One of these mini-groups has just started operating. Another has been operating over a year. This latter mini-group is functioning well. Considering a single unit of their area, the foresters are involved in the 5-year plan through the 1-year plan, the layout, and contract administration of the sale. After the sale is terminated, they make the plans and see to it that the area is restocked by either natural seeding or planting. Then they make the 1st-year surveys followed by the 3rd-year surveys. This is followed several years later by precommercial thinning and then the commercial harvest. So, the mini-group is involved through the whole cycle.

The mini-group foresters have to be trained initially by the resource group's rehabers. Then they have to work together with these same people on timing of the planting, grass spraying, and fertilization of the stands.

The time of planting comes in the slack time of logging so the min-group foresters can take advantage of this slack time to get more involved in the rehab work.

One weakness in having additional min-groups is having an increased number of people involved in rehab work. Where we used to have two people involved

in determining the amount and kind of stock needed, we now have four people and next year we will have six people. It will mean that they will have to sit around a conference table and work out their combined needs for stock and work up their material needed for invitation of bids for planting, spraying and thinnings.

Getting away from the mini-group and speaking of the district as a whole - in summary, it isn't just the rehab people that get involved with reforestation planning. The timber managers must have their planning well organized to get the best results in our rehab work.

PRECOMMERCIAL THINNING

Site Selection

Ideally, the stand we select for thinning would be in the 10 year age class; would have a high stem count and would be located on Site I lands on slopes of about 10%.

Unfortunately, we do not have any stand resembling the ideal. We are given broad guidelines to aid us in our selection of stands but when the choice is between a 10 year old stand on Site II lands with 800 trees per acre - against a 20 year old stand on Site IV ground with 2,000 stems per acre, the man doing the selection starts trading one condition off against the other.

In our area, which is the north one-half of the Coos Bay District, our selection is simplified by the fact that of 7,800 acres in need of precommercial thinning, 5,700 acres are in the 1951 Vincent Creek Burn. As a result we are concentrating our efforts in this area.

In general, we select the large blocks for thinning. We pick areas containing the greatest percentage of gentle slope because, as a rule, these areas contain the highest sites and greatest stem count. Our Second Stage Inventory has been of assistance here. Last year we had one contract with one unit of 520 acres. The stem count ranged from 200 to 6,000; and the slopes varied from 10% to over 100%. About 60% of this area was on slopes of 45% or less.

This year we have a contract in preparation which will have two units in the Vincent Creek Burn and one in the Loon Lake area. The units in the burn are of 440 acres and 190 acres. The Loon Lake unit contains 73 acres. We believe that we get lower bids and reduce preparation and administration costs by going with big units.

FOREST DEVELOPMENT WORKSHOP
Gleneden Beach, Oregon

Jesse Higdon - Medford District

Precommercial Thinning Projects
Development and Administration

According to the agenda, I am supposed to talk on cost estimate, "show me" trips, award of bid and low bidder.

Since we have had a total of three precommercial thinning contracts on the Medford District and I have been directly involved with only one of these--most of you probably know more on this subject than I do.

Cost Estimate

One way we have tried to arrive at a reasonable estimate is to lay out a test area of known size, thin it to our specifications, and apply the time it takes to thin the test area to the total acreage of the project.

Whether the figure arrived at is realistic or not is a matter of conjecture. Like every other type of contract, there are many variables or unknowns, such as:

- How much work is available?
- Time of the year.
- Access or travel time involved.
- Just how "Hungry" are the contractors at this particular time.

Most districts, which have done an appreciable amount ot thinning, probably have a reasonable idea of the costs based on past contracts. The information learned from the test plots will, however, give you some valuable indications as to spacing requirements, the time it will take to complete the contract, etc.

"Show Me" Trips

I think "show me" trips are of value. We have not, however, had a good response from the contractors. In fact, the major problem we have had on our contracts has been from contractors who have bid on an area, sight unseen, and then have wanted out after they looked at the area for the first time; usually the day work was to begin.

I would like to see stronger wording in the contract regarding on-site inspection of the contract area, before the bidder submits his bid.

Award of Bid - Low Bidder

This subject has been discussed many times concerning other contracts. I still think we need more latitude in selecting the successful bidder. Time and again, I believe we have actually spent more money on a contract by having to accept an incompetent contractor, when we know from past experience we would get a better job from someone else, even at a slightly higher "bid" price.

We seem to be making some headway in this respect. This year, I was able to reject one ridiculously low bid on a tree planting contract. This was the only bid, however, and if there had been more than one, rejection may have been more difficult.

I would now like to just mention some of the problems we have encountered on the Medford District regarding precommercial thinning.

The major problem is--we have no precommercial thinning areas per se. Our sites begin where the thinning manuals, statistics and other guidelines stop. That is to say, we start with site 4 or lower in most cases.

Some points that have been raised in the Medford District are:

1. Should we thin seed spot plantations? If so, at what size or age? This would also apply to planted pine plantations.

2. What do we do with our stands which are site 5 and below? Do we try and thin these to get an increase in growth; or do we let them stand and stagnate?

3. What do we do about competing hardwoods? Should we include these under thinning contracts or under a timber stand improvement program?

I have brought up only a few of the problems we face; they are by no means all of them.

PRECOMMERCIAL THINNING CONTRACT ADMINISTRATION

P. Kadaja

Since the Eugene district precommercially thins 4,000 acres a year, contract administration had to be streamlined to meet the workload.

Contractor's proposed starting date is accepted if his schedule and manpower are sufficient to meet contract deadline. This information is collected by mail or phone.

The first meeting is in the field. Unit boundaries are shown, and questions answered; detailed contract requirements are explained and sample marking done if contractor's respective crew has not worked for us before. An appropriate date for prework meeting is needed. The next day the completed work is checked, often in the presence of the entire crew, and additional directions, if needed, are given. The following inspections are scheduled, depending on the crew size when 10 - 20 - 40 acres have been thinned. Contractors and crews have been very cooperative in completing work to the inspector's satisfaction.

During the layout some trails are flagged. These trails as well as roads, creeks and ridges allow dividing the unit into blocks. As soon as a block is completed it is checked for acceptance. Although occular checking is prevalent in the case of experienced inspectors, the inspector establishes strip plots when he has doubts about selection or number of trees. If the thinning in a particular block meets the requirements, it is accepted. Otherwise, it has to be brought to standards for the inspector's next visit when it is checked again. If all blocks are found acceptable, no final inspection plots are established.

It is emphasized from the beginning that the besttrees are selected for leave trees and we are not unduly concerned about spacing. We try to avoid pure stands. Brush is cut only if it overtops leave trees. Low stumps are preferred, but only cut trees resting on a leave tree stem or near a road are required to be laid down.

On the plot every tree is classified as a leave or cut tree. Number of leave trees per plot/acre may differ from specifications of conditions so required. For instance, clumps of older trees are thinned more heavily than the rest of the stand. Thinning along travelled roads is lighter for appearance's sake and fire control. Flagged trails are required to be passable by foot traffic.

The inspector's log is filled in for every visit and phone call. Payments are prepared once a month and when 90% of the contract is completed.

We have special forms to be filled in after completion of the layout and a second one after thinning.

Paul Kiangas

PRECOMMERCIAL THINNING
AREA SELECTION

I. Area Selection

We need a district inventory of all stands which have potential for improvement through precommercial thinning.

The Roseburg District is now getting this through their Operations Inventory. The men in the timber management groups send their photos through the resource group for typing of clear cut areas by rehab people. In conjunction with this typing, we are compiling an inventory of potential precommercial thinnings. We are trying to co-ordinate as best we can with others in the district to report all stands of potential.

A. Stands of Importance:

1. Old Fire Types - 95% of thinning has been done in these types to date. Large burns have the potential for full development - roads, ponds, fertilizer. Small burns cannot be neglected, and should be thinned as soon as possible after access is available.

2. Stands under old growth overstory - These are the stands which take co-ordination with the timber manager for removal of the overstory with least damage to the new stand. In some cases overstory is left if the volume is small.

   We had one case to date where we had a co-ordinated effort between the timber management and resource management groups to pre-road a potential thinning area to remove the overstory of scattered old growth. Roads were required to be built before falling so that trees would be felled toward roads and tractor operators could ultimately find logs easier in dense understory. The plan worked, and we will be putting the area up for a thinning bid next fiscal year.

3. Stands of young reprod in 5→30 year old clear cuts - The better sites and the north slopes on poorer sites must be considered as potential thinnings. We are looking at these stands and putting into three year, five year, etc. categories for re-survey such as first and third year planting success surveys. These stands have great potential for intensive management because they usually have access and can be thrown in with larger areas.

4. 30+ year old even aged stands - The forgotten stands. Nobody wants to fool with them because they are thought to be too old for response, but they are too small for commercial value. Some of these stands are left after re-logging has occurred. Some have been under hardwoods on poor sites long enough to be suppressed. We must either thin these stands for maximum production, or clear them with a brush blade and start over. Not enough is known about the economics of thinning these old stands.

   Markets for 4" - 10" trees should be developed so that stands of this size do not have to be thinned on a pre-commercial basis. Some of these areas could be thrown into regular timber sales where they are scattered patches under old growth.

II. Photos

Best means of selecting potential thinning areas. All areas are considered potential for something - good precommercial thinning, poor precommercial thinning, brush, potential commercial thinning, potential tree stand, etc.

III. Type Maps

We never have had a good up-dated type map. Hopefully, the Operations Inventory will give us a better map. If the rehabers have the input that they should have into the Operations Inventory, they should not need the maps for that purpose.

IV. Field Checks

Check everything as time allows.

PRECOMMERCIAL THINNING LAYOUT

Walter Gilde

Salem District

There are few guidelines for precommercial thinning layout. We have some methods that fit our situation and possibly yours. Some are adopted from timber sale layout and others are somewhat original.

In marking project boundaries yellow flagging has been standard. We have used orange a lot and feel it is easier to see. Blue flagging works best where the project boundary is brushy. Especially if the areas will be thinned when the Fall colors are out.

Many times areas void of conifers exist within our project boundaries. The total acreage of these non-thinnable voids may be significant from a bid cost standpoint. However they are not mapable or easily flagged out on the ground. A good acreage estimate of these areas can be obtained from aerial photos. This acreage should be included in a bid information sheet as a guide to a prospective bidder. The contractor would still be paid on the basis of the more accurate gross acreage, but the total bid may be lowered by making bidders aware of any significant non thinnable acreage.

We have tried several spacings of leave trees and have settled on 12 x 12 and 14 x 14. The 12 x 12 spacing is used in stands 15-20 years old and on lower sites for stand 20-25 years old. The 14 x 14 spacing is used in stands approaching 30 years old and where a significant number of leave trees would be over 8" in diameter. We find these two spacings open our stands to provide growing room and still maintain maximum utilization of the site. We usually reserve all sound trees over 8" in diameter as leave trees regardless of their spacing. Eight inches is our smallest merchantable diameter class. We feel the spacing of these trees should be adjusted in the first commercial thinning. This would prevent the loss of merchantable volume existing at the time of the precommercial thinning.

We use two methods of mapping and acreage computation - traversing and aerial photo mapping. Traversing can be used for an area as with timber sale clear-cuts. Photo mapping can be used if the entire project area is centered on one photo. The terrain of the area should not be very irregular. The project boundary is marked on the photo when it is being flagged. Acreage can then be measured on the photo using an Avol ruler. Usually the photo scale is not the same as the 1" = 1,000 ft. scale that the Avol ruler measures. The scale of the photo must then be computed and used to correct the acreage obtained. If you want accuracy with this method precision measurements must be taken.

Our project maps include all prominent features that will help the contractor locate himself. These include roads, bridges, main cat trails, streams, ridges and obvious differences in timber type. Each project area has a demonstration area to illustrate the contract specifications. We use

more than one area when type or size differences occur on one area.

We have considered the idea of marking all leave trees on a thinning project. I will read the report of a study we made:

Title: Comparison of pre-marking a pre-commercial thinning versus contractor choice.

Objective: To determine if pre-marking a stand for pre-commerical thinning by professional foresters would result in a significantly better selection of leave trees, as compared to allowing the thinning contractor to select the leave trees under the supervision of a forester.

Work Required: Find a small uniform tract of reproduction that needs pre-commercial thinning. Mark about 8 acres of the selected 17 acre tract. Thin the remaining acreage utilizing the standard BLM pre-commercial thinning contract stipulations with the contractor choosing the leave trees. Examine both areas following the thinning to determine any differences.

Progress: Work completed September of 1971.

Results: There was a minor difference between the marked and unmarked area. The professionally marked area was more consistent as to leave trees and the spacing; however the differences were very minor. The difference was not considered significant enough to justify the additional time and expense needed to premark the area.

We have found the methods I have outlined to be adequate for our needs and continue to seek new methods to maintain accuracy and efficiency in Precommercial Thinning Layout.

FOREST FERTILIZATION

The following is a short bibliography of some of the publications relating to forest fertilization. Those with an asterisk are either quite complete or·of special interest.

*"The Entry and Fate of Forest Chemicals in Streams", Logan A. Norris and Duane G. Moore:

Considers the mechanism of entry and the fate of aerially applies forest chemicals in the aquatic environment. Reviews a Forest Service project in South Umpqua watershed.

"Results of Water Quality Monitoring Following Forest Fertilization of Two Small Waterhseds", Bureau of Land Management, Eugene, Oregon:

Reviews water monitoring on two fertilization projects in the Eugene BLM District. Considerable detail on measurements and monitoring.

"Newest Findings on Fertilizer Runoff", Bob Coffman, Farm Journal:

Reviews some TVA research and discusses probably trends of certain environmentalist groups.

"The Effects of Aerial Forest Fertilization on Water Quality for Two Streams in the Capital Forest", Merley McCall, Washington State Dept. of Ecology:

Studies of two streams near Olympia, Washington. Aerial application of urea resulted in some sharp but short rise in nitrogen in the streams. Probably because of direct application to the streams. Measurements should have been more frequent.

*"The Growth Behavior of Douglas-fir with Nitrogenous Fertilizer in Western Washington", Second Report by Gessel, Stoate, Turnbull, June 1969:

Studies in fertilization that began in 1950. Limited to Western Washington, but quite detailed. Found nitrogen generally increased the growth rate. Includes growth of both tree and stand.

"Nutritional Problems & Practices on Forest Land, January 1970", sponsored by College of Forest Resources University of Washington:

A very good meeting, much meat in handouts. Ankerstjern, Power, Snedaker and Wert attended.

"Fertilization", Forest Industries, September, October & November 1969:

A series of articles on current practices throught U.S. Interesting and easy reading. Authors include Stanley Gessel, University of Washington; Donald White, Michigan State University; W. L. Pritchett, University of Florida; Howard Horna, Container Corp. of America; Robert Strand, Crown Zellerbach Corp.; Richard Miller, Pacific Northwest Forest Service; Harry Anderson, Dept. of Natural Resources, Washington; H.S.D. Swan, Pulp and Paper Research Institute of Canada; George Bengston, T.V.A.

"Effects of Fertilization on Douglas-fir in Southwestern Washington", Pual Heilman, Washington Agricultural Experiment Station Circular 535:

Significant response to nitrogen but no response to P, K. S, or B. Little relationship to response and site. Some sites did not give enough response to be economic. Limited to portion of Washington, but quite a detailed report.

"Growth Response of 35-Year-Old Site V Douglas-fir to Nitrogen Fertilizer", by Donald L. Reukama, U.S.F.S. Research Note, PNW-86:

Covers a trial on site V land at Wind River, Washington. Revealed wide yearly variations in the growth pattern. In this study fertilization appeared to increase snowbreak. Growth increment was related to tree size. Height growth of fertilized trees increased.

*"A Progress Report on Douglas-fir Fertilization", Research Report 1-358, Crown Zellerbach Corp., 1969, R. F. Strand, J.Y. Lin:

Quite complete; however, BLM signed an agreement not to make the report available to other parties.

"The Decision to Fertilize Is Not Only an Economic One", Ian G. Morrison, College of Forest Resources, University of Washington:

Discusses impact of non-economic factors on fertilization projects.

"Height Growth Response of Douglas-fir to Nitrogen Fertilization", Stanley Gessel and Richard Walker, Soil Science Society of American Proceedings, Vol. 20, No. 1, January 1956:

Presents results of an initial application of nitrogen fertilizer on 15 to 20-year-old Douglas-fir. Trial was on site IV & V land in western Washington. Increase in growth was marked.

"Effects of Nitrogen Fertilizer on Survival of Paria Weirii and Populations of Soil Fungi and Aerobic Actinomycetes", Earl Nelson, Pacific Northwest Range and Experiment Station, Corvallis, Oregon:

Apparently high levels of nitrogen decrease the survival of Paria Weirii in the soil. Application of this idea is uncertain.

"Diagnosis of Nutrient Deficiencies by Foliar and Soil Analyses in Silvicultural Practice", S.A. Wilde, Wisconsin Agricultural Experiment Station:

Develops idea that foliar analysis is needed because of the interrelationships of nutritients and variations in availability of different forms of nutrients.

*"Sampling Procedures for Determining Forest Nutrition Status", Cooperative Extension Division Division, Washington State University, EM3459, 1971:

Procedures for collecting foliar, soil, or forest floor samples. Some discussion of interpretation of results.

*"Foliar Analysis and How it is Used, A Review", Dennis Lavender, Oregon State University Forest Research Laboratory, Research Note 52, 1970:

A guide for the collection and preparation of coniferous foliage for submission to laboratories for chemical analysis, and for interpretation of the mineral analysis.

*"Fertilization Response Estimates, 1969, How Much? What Is It Worth? What Does It Mean", Dept. of Natural Resources Report No. 19, State of Washington:

Summarizes regional studies, interprets meaning of results and estimates yields to be expected and illustrates methods of estimating dollar values and effect on allowable cuts.

FOREST DEVELOPMENT WORKSHOP

April 24-26, 1972

Salishan Lodge

Gleneden Beach, Oregon

Forest Fertilization - Medford District

Most forest land managers would like to have fertilization as another tool they could use to maximize yields on forest lands. I'm sure all of us here share the same opinion.

I will attempt to outline some of the problems concerning forest fertilization on the Medford District. There is no policy on forest fertilization, either at the State or the Medford District level. Medford has not done any operational fertilization. We do not want to do any until such time as research field trials, located on representative soils within the district, have been established and can provide data to give us reasonable assurance that we will receive benefits from the expense incurred. We have some very simple and sound reasons for this.

In the Pacific Northwest, the primary source of available research information on forest fertilization is centered on lands in Northwest Oregon and in Washington. Moisture is probably the primary limiting factor to the success of fertilization. The majority of the lands in our district are in a low-level effective moisture area, due to our hot summer climate. We have extensive areas of soils, sites and stand conditions for which no fertilizer data is available. We feel it may well be economically hazardous to conduct operational fertilization on these areas on the basis of existing information. We, therefore, feel it is necessary to obtain information on response throughout the district to help us determine whether or not we want to go operational.

To develop a rational basis for operational forest fertilization for a particular ownership within a region, three major questions should be posed, as follows:

1. Does regional experience with fertilization apply to the areas in question?

2. Does fertilization have possibilities as an economic investment?

3. How can response to fertilization best be estimated for the range of existing conditions so that fertilization investment can be intelligently guided?

We can answer "No" to question number 1. "We don't know" is our answer to question number 2. Question number 3 might best be answered by the proposal made to us by Mr. Dick Miller, Forest Soils Specialist with the Pacific Northwest Forest and Range Experiment Station.

In 1971, Mr. Miller presented a proposal for a far more intensive Nutritional Research effort with particular application to Southwest Oregon. He stated that there are numerous studies on nutrition and growth done or underway in Washington and Northwest Oregon. There has been little done in Southwest Oregon. He stated that, while the University of Washington program is a good one, it is not large enough to give us a variety of solid data based on a number of soil series.

Miller proposed a large program encompassing a number of most prominent soils upon which trials would be intensively studied for fertilizer effect in conjunction with commercial and precommercial thinning. It would be designed to fill the gaps not covered by the University of Washington studies. The Pacific Northwest Forest and Range Experiment Station has neither the manpower nor the money to undertake such a program without a large input of both from landowners.

Unfortunately, Mr. Miller's proposal, which is a good one, will have to lie dormat for the foreseeable future. The BLM does not have the manpower to commit to such a project. But this proposal should not be allowed to die. Pressure should be continually brought to bear to somehow initiate such a study cooperatively with the concerned landowners in Southwest Oregon.

Boise Cascade has some fertilizer plots on their lands near Medford. I understand that Weyerhaeuser Company is going to fertilize approximately 2,000 acres this fall near Klamath Falls. If we could get the cooperation of both companies and perhaps extrapolate some of their research data to our situation, we would be closer to obtaining some of the information we need.

In the interim, I think that project development and administration are the least of our problems. These are matters which we feel we can work out by (1) knowledge gained by other districts who have done operational fertilization and (2) by experience. We recognize that other districts are carrying out forest fertilization projects in order to gain experience in project development and administration.

In closing, I would say that Medford will probably not do any operational fertilization until we at least have some encouraging research results from the University of Washington studies now in progress, probably three to four years from now.

However, if, in the interim, we receive specific guidelines to go ahead from the State Director, we will proceed accordingly.

In the absence of research knowledge that fertilization can be a benefit in Southern Oregon, we think that leaving any potential growth benefit from fertilization out of the computation of the allowable cut is a correct move. When research shows that fertilization can be a benefit to the propagation of timber stands, it will probably be a factor of the allowable cut. At such time, we could endorse operational fertilization on this district.

by Paul Bodenberger

Wittmeyer (for Jerry Heinz)
Coos Bay District

Forest Fertilization Project

Development and Administration

Our experience has been limited. In April of 1971 we fertilized approximately 200 acres of 25-30 year old timber. The area fertilized included 100 acres that had been chemically thinned in 1970, 40 acres in our Homolac Seed Production Area and a remaining acreage that was generally overstocked.

We applied 200 lbs. of available nitrogen and 100 lbs. of available phosphates per acre.

We selected this area for fertilization because:

1. Were advised by Dr. Charles Davey, North Carolina State University, in 1970 that the seed production area should be fertilized.

2. We feel that the thinned area is ready for commercial thinning now. We should also open up the seed production area so will probably get a contract going this year.

The remainder of the area should be ready for commercial thinning within five years.

AERIAL FERTILIZATION

Gordon C. Orloff
Eugene District

My subject is contract administration of aerial fertilization projects. My experience in this field is very limited. I have worked on one contract for one day in the Sand Dunes, fertilizing pine and grass plantations.

I have had considerable experience with aerial spraying contracts which seems to me very much like aerial fertilization.

I will go through a check list that I have for myself on aerial spraying and relate this to fertilization:

1. *Are area boundaries marked? Very seldom done now. Weather balloons, toilet paper, adding machine tape, and flagging have been used. This is a real problem because of the even age stands that we are fertilizing.*
2. *Pre-Work conference (Pilots should be present).*
    - a. *Issue Notice to proceed.*
    - b. *Obtain names and phone numbers.*
    - c. *Discuss wage and labor laws.*
    - d. *Discuss contract specifications.*
    - e. *Arrange starting date and time.*
3. *Before starting, fly boundaries and streams when buffer strips are to be left.*
4. *Show pilot possible heliports and let him decide. Each pilot has his own idea of a good heliport.*

5. *Ask to see receipts for fertilizer. Inventory personally. Keep an account of amount to fill bucket and number of buckets applied.*
6. *Check coverage. This is hard to do sometimes because of no access. The ideal situation is to have one or two men checking coverage, one man at the landing and one man checking streams. These men should be in contact with radios.*
7. *Clean up site when done. Be ready to answer questions from the public. Some of the unknown factors in the Eugene District are:*
    1. *How Much Fertilizer is Lost in the Tree Crowns.*
    2. *How to Monitor the Coverage Accurately.*
    3. *What Effect Does Weather Conditions Have on the Fertilizer? Wet Crowns followed by Hot Weather, Snow, etc.*

CONTRACT PREPARATION FOR FERTILIZATION PROJECTS

R. J. Ankerstjerne

Preparation of any contract begins with identifying the specific tracts to be treated and the manner of treatment. Since the Salem District is comprised of considerable acreage of immature stands on at least average sites, identifying fertilizer application projects are quite easy. To this date, only stands which have been pre-commercially or commercially thinned have been treated with the recommended 200 lbs. of available nitrogen. Therefore, it is only fair to say that few problems have been encountered in contract preparation and boundary identification for these projects.

Our normal procedure is as follows:

* Identify the area
* Map the tract for project submission
* Submit project to the State Office about mid-December for review and approval.
* Contracts are normally offered for bid about February 1st, which allows sufficient time for completion prior to the close of winter rains.
* Past experience indicates that, allowing for weather, operations are normally completed within thirty days, usually between February 15th and March 15th.

It is our feeling that the present contract stipulations are quite adequate and provide the necessary controls for administration of fertilizer projects.

Miller
April 25, 1972

BLM TALK: INTENSIVE CULTURE OF DOUGLAS-FIR

1.0 INTRODUCTION

We have two basic strategies to increase wood production per acre.

2.0 TACTICS OF STRATEGY 1 (CONCENTRATE NATURAL PRODUCTIVITY)

2.1 Regenerate the area, but only to a point of diminishing returns.

2.2 Control the amount and quality of the growing stock.

- (1) Initial spacing
- (2) Control of least beneficial tree and brush competition.
- (3) Early precommercial and/or early commercial thinning.
    - a. Intensive thinning can increase total or gross yields.
    - b. Short-term growth of Douglas-fir can be reduced by thinning.
    - c. Nitrogen can help offset this delay, presumably because:
    - d. Removing surplus trees in commercial thinnings (CT) is desirable because:
    - e. We can lower the age for CT ... at a cost.
- (4) Later commercial thinning.

3.0 TACTICS OF STRATEGY 2 (MAINTAIN OR IMPROVE NATURAL PRODUCTIVITY OF DOUGLAS-FIR

3.1 Improve available moisture.

3.2 Improve soil fertility.

4.0 CONCLUSIONS

By selective use of silvicultural knowledge and tools, we can increase forest yields.

WESTERN OREGON TREE IMPROVEMENT PROGRAM

An inventory of BLM tree improvement activities in Western Oregon includes seed production areas, two seed orchards, one tree improvement cooperative, and cooperative research. Species presently under improvement are Douglas-fir, sugar pine, and noble fir. Current allowable cut computations include an 11 percent genetic gain in Douglas-fir and ponderosa pine beginning later in this decade. Mounting demands on limited resources and increasing tree improvement activities dictate planning at this time. Therefore, a State Office decision was made to develop a Western Oregon Tree Improvement Program. The purpose of the program is to provide planned, orderly, technically correct development of tree improvement efforts. This program is now under development.

The objective of the program is the optimum (maximum safe) genetic increase in the volume of quality wood through production of seed (and/or seedlings) for all acres selected for tree improvement. A survey of commercially valuable species suggests application of different levels of tree improvement to species according to priorities and restraints. Various levels will be applied on the basis of breeding units defined for species and ecologically similar areas. At higher levels of tree improvement, activities for each breeding unit will be according to three program plans: the seed production plan, the plus-tree testing plan, and the long range breeding plan. These plans will provide for production of seed (and/or seedlings) to provide a known genetic increase. When completed, the Tree Improvement Program will be the State Office planning base for tree improvement activities in Western Oregon.

HORNING TREE SEED ORCHARD REPORT

A. Objectives: (as planned for initial decade)

1. To establish a production orchard to supply Douglas-fir seed from one known parent for reforestation (planting) of middle elevation lands in the "wet site" areas of Oregon. Forty-five clones were to be established on ten orchard areas each, for BLM seed zones 1, 2, 3, and 4, and four clones to be established on five orchard acres each, for BLM seed zones 5 and 6.

This orchard would provide enough seed at maturity to grow all seedlings needed for regular planting programs.

The initial effort was planned as a general upgrading of seed through known, local parentage and parent tree selection.

2. To establish a basic nucleus of potentially superior Douglas-fir breeding stock with a clonal tree seed orchard for the purpose of genetically improving the planting stock which is used to reforest the prime timber producing lands managed by BLM.

B. Plans:

1. To establish a high elevation tree seed orchard to provide seed for reforestation of areas which are at elevations above 2500 feet in the Cascades, or 2000 feet in the Coast range. Purposes and procedures are pretty much the same as given previously for middle elevations.

2. To start work on a noble fir tree seed orchard.

3. To provide tree seed extraction and cleaning service for orchard produced cones as well as other cones, either Bureau collected or procured.

4. To grow containerized tree seedlings for testing genetically improved seed, parent evaluation through progeny testing, and for regular reforestation programs.

C. Progress:

1. Grafting for the production tree seed orchard for middle elevations is now complete except for fill-in grafting and final compatibility testing. Thirty acres are completely in place and the majority of ramets are ready to place in the remaining 20 acres.

The first cones were collected from the first year of grafting in the orchard in the fall of 1971. By 1975 (on schedule) the ramets in the orchard will be ready to produce cones in limited quantities.

This spring 3,000 spreader grafts were added in the orchard and another 500 were put on in the clonal test area. 2,740 new grafts were made, using

scions from selected high elevation parents; 120 parents from BU 32 in Salem District and 17 parents from BU 33 in Roseburg District.

Approximately 25 noble fir parents have been selected and 16 have been collected. These were grafted (some on noble fir rootstock and some on grand fir rootstock) on potted seedlings placed in the shade house. When clearing is completed they will be moved in place in the orchard.

2. Seed extraction began this past season. We constructed a pilot kiln to dry the cones. Set up a brush de-winger and an auger-type de-winger, a fanning mill, and an air fractionator for cleaning. About 600 bushels of cones have been processed as well as various small lots of special collections from Medford and Salem. No real difficultires, other than equipment procurement, were encountered.

A large modern seed extraction facility with a production capacity of approximately 4,000 sacks of cones per season will be constructed in FY 1974.

3. The containerized tree seedling program has been very interesting. In 1970 we started with 50,000 bullets in a newly constructed lath house - gas fron the treated timbers wiped out the entire crop. That fall we constructed a makeshift greenhouse and successfully raised 9,000 seedlings. The winter-grown crop was planted in the spring of 1971 with good initial success. In spring of 1971, we constructed a 70' x 100' Saran cloth shade house on a parking lot and filled it with 500,000 containerized seedlings. Open shade house planting must be after the first frost so we seeded the first week in May. Seedlings produced were small because of the short season and did not harden off soon enough. They were severely frost damaged. Results from this crop have not been assessed but will certainly not be very good. This spring we will cut back to 200,000 and must again seed in May. We hope to be able to add more fertilizer and will attempt to harden these off in August. 50,000 will be in the new 8 cu.in. blocks and will probably not develop roots enough to pull this fall. The majority of the seedlings will be in 2.2 cu.in. improved blocks. These we hope to jell, coat with the new "plastic jell" from 3-M Company and ship in boxes. Bio-degradable bullets are on the way but we will not have them for another year. A prototype greenhouse 42' x 100' will be constructed in FY 1973 and hopefully will allow early seeding and a full 6 month growing season for a limited amount of seedlings for next year.

Comments:

In general the workshop was timely and to the point. I felt that the section on containerized seedlings was a negative discussion on a subject which has not been thoroughly tested. Most of the ills of the system can be cured, and will be cured within a few years. We are proceeding as fast as most private companies and are ahead of them in some processes now. I do not feel we should back off until we really find out the worth of the program.

Salishan was an excellent choice of location, food was good and surroundings conducive to a successful session.

/S/ Bill Taylor

SPRAGUE SEED ORCHARD - 1972
OBJECTIVES, PLANS AND PROGRESS

By Pete Prack

I. OBJECTIVES:

The steadily growing national need for wood products is placing constantly growing demands on our resources. With a steady land base, it is imperative that increased wood yields are necessary. With this in mind and present growth-cut ratio, 1:3, (with a regulated forest ratio of 1:1 serving as a base) our objectives are clear; intensive forest management, meaning full land utilization, latest available techniques and as Peter Kadaja stated, the right attitude and feeling for the woods.

The Bureau's objective in the Sprague Orchard is the production of superior seed for reforestation use on 625,000 acres in the Medford District and approximately 200,000 acres in the south part of the Roseburg District.

The tree improvement procedures, tree selection, problems with graft incompatibility, pollen contamination and others were explained by Bill Wessell.

We know that genes control the development of all living plants and animals. Combination of this knowledge and common sense should give us what we are after: A realistic return from our investment.

The figures quoted by other agencies and private companies indicate that this investment will be a large one. The average cost of a fully developed operational seed orchard in the South East part of the United States is $5,000.00 per acre. In the Pacific Northwest, the average cost is about $2,000.00 per acre. The same figure applies to the Sprague Orchard. This is a rather large sum of money but compared to the annual cost of blister rust control on five needle pines, this expense is fully justified. It would take nature more than 150 years for reintroduction or re-establishment of these pines in the forest if we did not try to help and this time lag we cannot afford.

In Idaho, for example, the cost of blister rust control on WWP was reaching $1,000,000 per year. Today the entire WWP BRC program in that state, costing far less, is geared to genetics and the natural resistance to blister rust.

This is where the Sprague Orchard differs from many orchards in existence today. Our objective in Merlin is not only tree improvement, meaning better growing trees, but first the development of Rust Resistant Sugar Pine.

A program to develop and to perpetuate a five needle pine, resistant to "Cronartium Ribicola" was initiated by the BLM and USFS in 1957. In 1958

both parties signed a cooperative agreement to develop such pines and to suppress the spread of blister rust. Following this agreement, a plan was prepared for carrying out the agreement. The important points of this plan are:

A. 1. Total acres for S.P. Management - 318,586 acres
   2. Total acres for WWP Management - 399,420 acres

B. BLM to furnish complete facilities for development and production of rust resistant sugar pine and the Forest Service for WWP.

C. 1. Sugar pine production to start in 1985 and to reach a peak of 2,102 lbs. by 2000 A.D.

   2. WWP production in Dorena to start immediately and to reach 240 lbs. per year in 1985.

   3. BLM share of sugar pine seed - 34%.

II. PLANS:

A. Production

Our plantation plans and seed production goals are based on needs. Depending on geographical location, elevation, life requirements, and management goals, each area is treated separately. The size and seed needs of these areas dictate the type and size of the orchard plantations. Out of a total of 158 plantable acres in the orchard, 85 acres will be used for sugar pine and the remaining 73 acres for Douglas-fir, ponderosa pine and other species.

B. Construction

FY '72 - Fencing of 146 acres
Lab-Office Building

FY '73 - Clearing 55 acres
Establishment of 3 acres sugar pine nursery.
Green house construction.

C. Tree Improvement

D.F., P.O., I.C., W.F. - District needs and financing will be the controlling factors in this program. Based on approved state-wide tree improvement plan, plus trees will be selected and their progeny tested in the orchard and selected out-plant areas.

Sugar Pine

1. Additional 500 rust resistant candidates will be selected by 1975, in seven individual zones. (required 1200 with proven rust resistance out of 2000 selections.)

2. S.P. Nursery - three acres prepared for seeding in 1972 (600 M/year production).

3. Collection of seed from selected trees for rehab use and pine testing.

4. Grafting - collection of scion wood.

5. Geneotype rating strains.

6. Planting - ad. 3438 progeny in orchard.

7. Development of 15 out plant areas for blister rust evaluation and growth characteristics in addition to 15 acres already in existence.

8. S.P. seed program in the orchard will be used for rehab use on 108,630 acres of BLM land and 215,156 acres of FS land, for a total of 318,586 acres.

9. Production

a. Seed: 1 lb. = 840 plantable seedlings
1 lb. = 2½ trees in orchard

b. Grafts: Pollen - 2 to 3 years
Cones - 9 to 10 years, full 15 years

c. Progeny: Pollen - 15 years
Cones - 25 years.

d. Expected cone production - 8 cones/year/tree after 30 years.

D. Manpower: FY 73-74 Requirements

S.O. Manager	1			
Geneticist	1	63 Perm.		49½ Temp.
Clerk-Records	1		112½ MM	
Technician	1			
BRC Foreman	1	34 BRC		78 Casso
Equipment Operator and) Maintenance Man)	→ 1			
Temp. Orchard	1		15	
BRC	1	6 Perm.		9 Temp.

112½ MM = 77½ - 9600+35 - 5220

III. PROGRESS:

Sugar Pine

Plantation -

Established:	1968 - 30 acres
Spacing:	24'x24' for progeny, 12'x12' for root stock
Planted:	1,817 progeny, 6,622 root stock
No. of Crosses:	65 from 5 zones
Grafts:	1972 - 102 on progeny, 730 on root stock
Classes:	20 classes represented in grafts
R. R.	75% on progeny, 730 on root stock.

Tree Selection - 770 candidates selected to date (559-FS and 211-BLM) of which 220 show resistance to blister rust.

D. F. Selected to date - 37 trees in Medford, 4 trees in Roseburg.

Seedlings: 2,000 2-2 potted seedlings from 9 clones ready for orchard planting. 616 seedlings from 5 clones planted in out-plant areas.

Development Cost:

Land - Clearing, Site Preparation	$ 44,702.00
Fencing	21,638.00
Dam and Reservoir	53,138.00
Irrigation, 2510 feet, 6" line, 500 feet irrigation pipe, hydrant	25,155.00
Well #1 - 116 GPM - 100 feet	3,031.00
Well #2 - 150 GPM - 150 feet	7,113.00
Pump - Well #2 - 20 HP, 2 speed	5,806.00
Pump Well #2 - Discharge	2,983.00
Pumphouse	6,763.00
Lath House	6,600.00
Shade House	1,000.00
Shade House Irrigation	774.00
Warehouse	14,162.00
Septic Tank & Drain Field	1,307.00
Roads - 2.9 miles	16,509.00
Admin. Site - Fill, leveling, seeding, clearing, irrigation	7,119.00
Clearing 74.2 acres NW Block (240 - 1 acre)	17,820.00
	$ 234,628.00
Equipment	12,114.00
TOTAL:	$ 246,742.00

This investment represents only a fraction of the world wide tree improvement effort. It may sound large to us today but we must realize that we are striving not only for economical profits but also great social and environmental gains to satisfy human needs.

CONTAINERIZED PLANTING

by David J. Miller - Medford District

The Medford District has been involved with containerized planting for two seasons now and, unfortunately, we are not in any position to brag. Many of us have mixed emotions concerning the program for reasons that my presentation will try to bring out.

In FY '71 we planted about 20 M 1-0 DF bullets. All of these bullets were planted by the District Force Account crew at a cost of about $21.00/M. Study plots were laid out in the fall but early snow postponed planting until late winter and early spring. As a result, the 2-0 DF bare roots that were used as a comparison were kept in cold storage for several months which made the quality of these trees questionable. The bullets, for unknown reasons, were not in the best of condition either as most of them had a yellowish color.

Two surveys of the study area plantings were made which give a very distinct comparison. The first survey was made in June, prior to the onset of the dry season, and resulted in an average of about 40% survival on the bullets vs. 85% on the bare roots. A follow-up survey was made about three months later, after many of our hot and dry southland-type days, and yielded about 0%-10% on the bullets and abou5 50% on the bare roots. Most all of the plots in the study were on "average" planting sites for the Medford District. The individual plots in the study were located so that all types of conditions for the locale would be subjected to the test.

In FY '72, Medford planted about 55 M bullets, all of which were planted under contract. We had intended to include 29 M plugs in this contract but we ran into difficulty removing the plugs from their containers; so, we felt it best to delete the plugs from the contract.

The cost of contract planting of bullets were quite high. It ranged from $50.00-$65.00/M for normal bullet planting to $180.00/M for bullet planting with scalping of grass and other competing vegetation.

The scalping reduced the average production rate to 300-400 trees/man day vs. 1,100 trees/man day for normal planting of bullets. The scalping required the contractor to have a crew of three or four scalpers for each planter.

To date, no follow-up surveys have been made on this planting, so we have no indication as to what kind of results we may expect.

We have experienced some problems with bullet planting, some of which we may have some control over and others we will just have to live with if we continue with the bullet planting program. A few of these problems are:

a. Breakage - We experienced a significant amount of bullet breakage on our contract planting. It ranged from 10-15% on the good areas and from 30-40% on the tough areas.

b. Planting Gun Operations - The planting guns apparently would get out of adjustment and a considerable number of bullets would be scored heavily before they could be detected.

c. Steep Ground - Use of the foot-dog was quite awkward, if not impossible, on steep ground. This necessitated the planter to slam the gun to the ground with an arm motion which we feel was responsible for a large amount of the breakage.

d. Overplanting - Where planting was easy and the method of payment was by the M, the planters had a tendency to tighten up on their spacing and overplant. This was not the case, however, when scalping was required.

e. Contract Administration - This type of planting requires constant administration in order for a good job to be done. This is well and good providing we have the manpower to devote to it. This can be a big problem during a busy planting season.

For FY '73, Medford does not intend to plant any bullets. We are, however, planning to plant 68 M 1-0 plugs and 23 M 2-0 plugs left over from last season. But we are doing this with some reservations as we still are not positive that we will be able to extract the plugs from the containers. We are keeping our fingers crossed.

We, on the Medford District, do not feel that 1-0 bullets will survive in Southern Oregon because of our shallow, rocky soil and our very limiting moisture conditions. Perhaps 2-0 might be the answer. We don't know.

I do not believe that the opinions of our rehabilitation foresters are unique as one of my coworkers has spent considerable time seeking information from various corners of private industry. For what it is worth, I would like to briefly summarize the comments we received concerning containerized planting.

> Mr. Bergman, Willamette Valley Industries: They are running field trials with bullets and mudpacks from Canada. They are getting good results with both so far but are concerned with root constriction in the bullets.
>
> Mr. Leach, Indpendent Nurseryman: He is growing bullets and plugs for about twenty companies. He is developing a new container system for growing plugs which he claims is better than anything else available. He had expected to have some available for rent or sale on a limited basis by March 1972.

Mr. Clark, Crown Zellerbach: They have abandoned all bullet plantings and are coverting to plugs. By 1973, they plan to be using nothing but plugs. C-Z is concerned that, with bullets, (1) roots cannot penetrate the plastic in critical moisture areas and (2) you cannot get consistent moisture in the bullets by irrigation. They are basing their big move to plugs on physiological considerations for survival. A new six-inch plug container of their design will be used.

Mr. James Dick, Weyerhaeuser Company: They dropped their bullet program several years ago. They tried various materials for containers, from milk cartons to plastic, and found them all unsuccessful. Weyerhaeuser is going to experiment with a new eight-inch plug of their own design.

Mr. Moat, International Paper: They have been using bullets for three years and plugs for one year. They don't yet have any meaningful data but indications suggest to Mr. Moat that they might eventually go totally to plugs. Mr. Moat suggested that, after this planting season (this spring), representatives of the major companies, Forest Service and BLM hold a meeting to discuss the status and future of containerized planting.

Mr. Crosley, North Western Pulp & Power, Ltd.: He feels the main problem with bullets is the fact that we don't have a container that is degradable. He feels we have to use a tube that is highly degradable or use none at all.

Mr. White, Michigan State University: "I think there is a real problem with any container system: You must get the roots growing into the soil right away after you put them into the field or you are losing your best opportunity to get good establishment."

Mr. Adams, State of California: They have tried bullets of several sizes with no success. They feel moisture was not retained long enough in bullets to permit seedlings to maintain growth so roots could penetrate to surrounding soil moisture.

It is quite evident that private industry has been experimenting with various planting methods and they have a wealth of information that may be of benefit to us. I think Mr. Moat of International Paper has the best idea - that of everyone getting together to exchange current information. In view of this, I would like to see such a meeting set up so successes and failures can be better analyzed and useful information be shared by all.

We feel that, if this type of information had been shared in the past, a more productive program could have developed and possibly eliminated some of our trial-and-error efforts.

In the "banana belt" of Southern Oregon, where moisture is extremely critical, we believe that a system of planting where the seedlings, possibly

2-0, are planted with a package of soil around the roots, whether it be in the form of mudpacks, plugs, or bullets, which use a degradable container, may possibly improve greatly upon our present bare-root system.

In summary, we should explore all possible avenues of approach but let's be sure to look at what others have done and benefit fully from their experience.

CONTAINERIZED PLANTING

This past year the Coos Bay District received 90 M containerized seedlings; 45 M were bullets and 45 M were plugs. One contractor did all the planting. Here are his comments:

Dibbles (plugs)

1. Need to develop sideroots along with the top so each tree might pull more efficiently from slot.

2. Very difficult to see after planted, inhibiting spacing.

3. Can't plant when it rains or freezes - they either pull free, exposing bare root or they are impossible to free from box.

4. Foot pedal not needed.

5. Trees we received were in generally bad shape.

6. Best not to water a day or so before planting - trees seem to pull more easily when drier.

7. Dibbles better on steeper ground than guns.

8. Packs useless except for packing trees to general area of planting and bringing back empties - waist belts needed; weakest weld is on the slip handle.

9. With dibbles the main problem is the trees and how their roots do or do not pull free from the box. We experienced an average of 25% to 40% of trees not making it into the ground (due to dead trees, trees missing from box, and root pulling free from dirt.)

Guns (bullets)

1. Heavier springs - guns fill with dirt and make it impossible to plant. Narrower springs would help eliminate dirt.

2. Packs are useless in steep ground. Packs only good for transporting trees to immediate area of planting. Carrying bags would be much better.

3. Something biodegradable for trees to be placed in.

4. Difficulty planting steep ground with guns.

5. Foot pedal not needed.

6. Guns are better than anything in tight spots (between logs, rocks, etc.)

7. Better not to use aluminum bolts - they strip too easily.

8. Aluminum shaft or tube can be lowered or ventilated down its length - guns don't have to be as heavy as they are.

9. Suggest a more permanent and/or heavier circular cutters.

10. Prefer guns to plugs for planting - much better tree average. You can also cover more ground in a shorter period of time. The rhythm is more efficient.

The plugs were frost-bitten and did look in pretty sad shape when I first saw them. The bullets were in much better condition. Even though the plugs looked bad we planted them. As a check we planted 100 randomly selected plugs in a special study plot. We will check survival at the plot this fall and perhaps get some indication of the success or failure of the others.

The study plot, by the way, was originally planned to compare survival between bullets, plugs and bare root stock. We will probably try to establish a similar plot this coming season.

One other observation I made was that the plug didn't conform to the shape of the dibble. The diameter at the bottom was about the same but at the top the dibble was about 1/3 larger. I wonder if a more tapered plug would lift easier.

Our field inspectors made the following comments:

1. Perhaps guide ridges inside the gun to lead the bullet groove to the cutters, or more scorelines on the bullet were needed to assure that the cutters hit the score lines. One man felt too many bullets were broken above ground. Another said if the bullet was kind of tapped in with a series of thrusts rather than with one plunge, less premature breakage occurred.

2. Plug trays had to be presawed in some manner and the planters never learned to use the individual tray holder. They generally removed some trees in the center and used the holes for finger holes. One suggestion to improve bullet carrying was to have them inserted in a gunbelt-type arrangement. A roll of trees could then be carried in a conventional planting bag.

3. Storage of plug trays at the district office required special shelving. This could be overcome by redesign of the styrofoam tray so that it was self-supporting. Some of our fellows came up with a design they think will do the job.

This coming year we have only 100M container trees being grown. I would like to be able to do this locally rather than at the Horning Orchard because I'd be happier with more direct control. However, I haven't found a willing contractor and we certainly do not have the manpower to devote to seedling care.

I personally like the containerized approach because it offers a fresh tree and not a refrigerated one. If we had our own nursery where trees could be lifted in the morning and planted, maybe I'd go back to the bareroot 2-0 stock.

CONTAINERIZED PLANTING OF DOUGLAS-FIR IN THE EUGENE DISTRICT

BILL JOHNSON
4/25/72

Like other west side districts, Eugene has used containerized trees on a limited basis only -- to evaluate survival and planting methods. If survival is high enough and planting procedures can be worked out, containerized planting will eventually become a part of our reforestation program. At present we are trying plugs and bullets on Site II clearcuts that previously would have been seeded.

In F.Y. 1971, 5,000 bullets were planted experimentally on the west side of the Eugene District in the Coast Range. This year, 80,000 containerized trees were planted on the district, 40,000 on each side. Two thirds of these were bullets, the rest plugs.

Planting was done by our force account crew. Breakage of the plastic containers during planting was the main problem with the bullets. Hard ground (semi-frozen soil, cat trails, stony soil) resulted in breakage of about 50% of the bullets. More careful selection of planting sites by the planter can reduce this loss somewhat, but as long as there is no way to probe the planting hole before committing the bullet, there will always be a high loss from this breakage on all except the most favorable areas. Plugs, in contrast, do not have this problem. If the first spot the planter picks for the plug is unsuitable, he can select another place nearby before committing the tree.

In planting plugs, our force account crew found it easier to work in pairs. Both men carried trays on their backs. One man selected planting

spots and made holes with a dibble while the other man followed close behind and placed a plug in each hole. This second man found it easier to carry the styrofoam tray in one hand by grabbing it through two empty holes and pulling out the plugs with the other hand.

There was a problem with pulling the plugs out of the trays. About 30% of the trees pulled out without taking their soil media with them, resulting in loss of these trees. These trees were almost always smaller, less vigorous trees whose roots had apparently not developed enough to bind the soil media.

A sharp rapping of the tray helped reduce sticking of plugs and reduced this loss somewhat;leaving trays out in the rain will result in media with the consistency of oatmeal, so trays should be covered when left outside.

Plugs placed in the planting holes were not stamped in. Instead, the loose plug was allowed to be silted in by rainfall.

5,000 bullets were planted on the West Side a year ago. There has been "some" mortality, thought to be due to the mix. There was also some frost heaving, but the surviving trees appear to be all right. The bullets were planted in alternate rows with 2-0 bare root stock. The 2-0 trees had moderate deer damage, but the bullets were not damaged at all. This may change as soon as the bullets reach the same height as the 2-0 stock when planted, and are equally accessible to the deer.

In the field plot established this year on the East Side, 100 bullets and 100 plugs were planted a foot apart at each planting spot

of an 8' x 8' spacing. The plot was checked last week and the following was found: (1) Mortality of the plugs should be much higher than that of the bullets. 72% of the plugs had crowns that were at least half dead at time of checking. In contrast, only 22% of the bullets were this way. We haven't determined the reason for this difference. Both plugs and bullets were planted in the same general spot by the same planter on the same day. Maybe we can blame the mix again. (2) Plugs frost heaved somewhat, but more of the bullets frost heaved, and these usually more severely than the plugs. Many of the trees partially heaved were still alive when checked, and should survive this. (3) There was no deer damage as yet. The plugs and bullets have been in the ground three months now. (4) There was a little smothering by chunks of wood and soil debris rolling on top of the trees.

So, in summary, we feel that containerized tree planting has yet to prove itself, despite all its reported advantages. Plugs worked out better than bullets in the actual planting operation, but we will have to develop a better backpack so our crews won't have to team up to plant the plugs.

FOREST DEVELOPMENT WORKSHOP

CONTAINERIZED PLANTING IN THE ROSEBURG DISTRICT

Curtis J. Ritter II

The Roseburg District containerized planting program began in the winter of 1970-71 when 7,000 Douglas-fir bullets were planted. These 7,000 trees were equally divided and 3500 were planted in the North half and 3500 were planted in the South half of the District. Both the North and the South areas put in survival plots. Inspection of the plots at the end of the first growing season indicated that we had about 20% survival. This poor survival could be attributed in part to the poor condition the bullets were in when they were received from the nursery.

Our first experience with plugs was this season when we planted 60,000. Test plots were put in this year comparing bullets to plugs. The first results from these plots should be available after the first year survey. Next year Roseburg plans to plant 100,000 containerized trees: 75,000 plugs and 25,000 bullets.

It is felt, that in its present state of development, containerized planting has many disadvantages. The greatest disadvantage is how awkward the containers are to use under field conditions. In the Roseburg District, the majority of old-growth timber and subsequent reforestation areas are on steep slopes (30% and above). On these slopes it is impossible for a planter to carry a tray of trees in one hand, a dibble or planting gun in the other, keep his balance, and still plant a tree. Some convenient method of carrying planting stock must be devised. The backpacks that are currently in use are completely inadequate. A backpack puts the center of gravity too high for balance on steep ground. Also, it is impossible to remove trees from the backpack without taking it off. A method of carrying containers(plugs & bullets) in a planting bag should be developed.

Another problem encountered was the disposing of the empty styrofoam or plastic trays. Carrying these empty containers puts an added burden on the mobility of the tree planter. Yet it is impossible to leave these virtually indestructible containers on the planting area. At the present time

we require the planter to return empty trays to pickup-points on landings. Also, these trays are so bulky that they limit the amount of trees a planter can carry into the unit. Using backpacks and trays a planter can't carry enough trees to allow him to plant a full half day. Much planting time is lost in transporting trees to planting areas. If these problems are not resolved we can expect higher bids for container planting in the future.

Two major disadvantages of the containerized system of planting to the District, are finding suitable storage areas for trees awaiting planting and the logistic problems of moving bulky trays from nursery to district to field.

Our reservations about containerzied planting concerns the depth that plugs and bullets are planted. We believe that unless the roots of a planted tree extend 8" into the soil that its chances of survival are greatly reduced in the Roseburg District where an extended summer dry season prevails.

One final problem noted about planting this year was the failure of many plugs to pull free from their containers. In many cases the trees simply pulled through the planting medium. In other cases, pressure applied while pulling on the tree caused the bark to slip at the base of the seedling, thus girdling it. Trees planted late in the season seemed to come loose from their containers better than those planted early. This could have been caused by a change in the moisture content of the planting medium or by added root growth.

In conclusion, there may be a place for containerized planting in the BLM reforestation program, but the problems mentioned should be resolved before containerized planting is considered operational.

CONTAINERIZED PLANTING

Peter Kirk

Salem District - Tillamook Resource Area

The Salem District began its containerized planting program in the spring of 1971 in a trial run of about five thousand bullets which were grown at the Horning Seed Orchard. The seedlings were planted in favorable sites to insure the best possible chance of success. The results taken from surveys last fall varied from 5% survival on one unit on the west side to almost 70% on the east side.

The FY '72 planting program contracted for 125 M seedlings with one-half each of plugs and bullets, all grown at the Horning Seed Orchard. Because of an initial failure at the orchard in the early spring the plugs had to be resown in June. They were quite poor because of the short growth period of five months plus an early frost that caused severe browning of the needles.

In Tillamook we planted 30 M plugs and bullets on two units, at a contract bid of $39 per M. The contractor indicated his individual estimate on the plugs was $46 per M and $31 per M for the bullets. Later he indicated that he was considerably high on his estimate for the plugs since he could plant them at about 1.5 M per man. He also said he would bid higher on the bullets. In comparison, the bids for our bare root planting contracts averaged about $55 per M.

Problems:

Plugs - (1) Because of the poor stock, planting the plugs was very difficult. About 20% of the seedlings would not hold the soil mixture when lifted. These were discarded by the planter at first. Later we instructed the men to plant all trees as best they could.

(2) Spacing was a problem since the trees blended well with the slash and could not be easily seen. Because of slash and duff accummulations the planters had trouble finding plantable plots and tended to overplant small areas or plant in clumps. Not being able to scalp away debris compounded the problem.

(3) The dibble seemed to be inadequate for the job. The hole would often fill up with soil or debris, resulting in improperly planted plugs. Many of them had exposed roots when planted too shallow.

(4) The styrofoam container had to be carried in one hand (200 seedlings) with the dibble in the other, making it awkward to move over steep ground.

Bullets - (1) The main problem with the bullets was breakage. About 20-30% would break before being planted, especially on rocky soils and

compacted ground such as cat trails, landings, etc. Some would protrude out of the ground exposed to drying.

(2) At least 30% of the bullets would not score properly. This could result in roots not escaping the plastic container fast enough to insure survival. Many of the guns would jam frequently.

(3) Again, spacing was a problem, especially since the units were not burned. The planter would plant in clumps, each tree about 4 feet apart.

Administration -

(1) The basic problem in contract administration was attempting to maintain uniform spacing of the seedlings. We tried to keep the planters spaced apart which proved impossible. They would not plant uniformly. In taking planting inspection plots it was almost impossible to see the plugs.

(2) It was very difficult to determine the amount of bullets which were not scoring properly or breaking. This would greatly affect the estimated number of trees needed to adequately stock an acre. The maintenance of the planting guns is another problem. The cutting blades would become worn and out of adjustment.

(3) The planters had a tendency to cull out too many plugs. We had to watch the men carefully.

Recommendations:

1. I firmly believe that slash burning is absolutely necessary for proper site preparation in any containerized planting project. Too many areas are impossible to plant, especially when the planter does not have a hoedad to clear debris. We must initiate an intensive slash disposal program including spring and summer burning.

2. In many areas larger stock is needed to better compete with brush species. A two-year-old seedling would also have a superior root mass and would handle better in a plug. The larger trees could be seen easily, thereby eliminating spacing problems.

3. Develop a specialized "drill" auger that could be used to plant the larger plugs. It would have to be a high speed drill that could easily penetrate rocky or compacted soils, roots, duff, slash, etc., accommodated with a scarifying disc perpendicular to the drill bit. This auger could greatly increase our plantable areas previously unplantable by conventional methods.

4. Plant western hemlock and sitka spruce in areas of intensive brush concentrations. These species would have to be two-year-old seedlings in order to grow enough root mass to hold in a plug.

Conclusion:

I believe the plugs have a much greater potential than the bullet container. From the reports gathered from private industry I would assume that a biodegradable container or plug type of seedling seems to be of increasing value. The plastic bullet causes considerable root binding and is less desirable, especially in drier sites.

I firmly support our containerized program and feel we should begin developing the plug type seedling on a large scale. The bare root system of planting has been, and is, inadequate to insure the desired regeneration that is possible. A large seedling in a plug or biodegradable container planted by a high speed auger would insure the maximum results in our reforestation program..

ENVIRONMENTAL CONSIDERATIONS IN FOREST DEVELOPMENT

by Peter Pusvaskis

April 26, 1972

Being foresters and others related to outdoor occupations, we are concerned with harvesting the resources growing on the land and manipulating the vegetative growth. Here we consider the impact of the forest development projects on environment. First comes the virgin forest. Our economy and society demands that the forest be cut to satiate our standard of living. The first big environmental disturbance is the clearcut, we require wood for many important uses. So the first step in actual forest development is to build roads and clearcut the forest. The Eugene District clearcut approximately 2500 acres last year. To prevent any drastic change in environment other than tree removal, we plan before the time of harvesting what will be the effect on soils, water courses, aesthetics, recreation and construction of roads so that there is a minimal effect on erosion. Yet, for example, if we don't like the way a drainage naturally enters a culvert we build the stream bed so that it becomes a sluice way into the culvert. (The Soil Conservation Service carries on a program of straightening stream channels involving many natural water courses. The environmental change it has brought about is being opposed by sportsmen and other organizations.) We gross yard some places and try to sweep the cutover area clean. We consider uncut strips along streams to protect water quality and fisheries. We don't burn slash, or we burn under controlled conditions. We don't leave seed sources. We use specialized logging methods and equipment such as skycar. We consider uncut strips along the road so that clearcut areas are not visible to the traveling public. We also try in some ways to bound these clearcut areas in an irregular fashion to depict natural occurrences such as fires. At any rate the environment is changed or disturbed, but the change and disturbance is a matter of gradation. By this I mean if there were other resources to be gleaned off the clearcut area, then certainly we would take them off. We would disturb the environment only to the extent it was required to satiate our high living standards.

The criteria for clearcutting in proposed Presidential Executive Order (Journal of Forestry - Feb. 1972) is shown on the attachment.

Next, after the clearcutting, comes the rehabilitation of the area either by planting or seeding. If we seed, we protect the seed from being eaten by birds or rodents by coating it with a repellant or toxicant. Not long ago endrin was used for this purpose but has been discontinued because of its toxicity (-- I read a news article two years ago where a disgruntled employee in the Midwest (Endrin Mfg.) dropped a half bushel (dry wt.) of

endrin in a small lake. Result - it killed the fish and amphibians, and the State had to spend thousands of dollars to clean up the water. They filtered the poison laden water through carbon particles before releasing it into the stream.)

I have a recent memo from Chief, Division of Resources, March 30, 1972, concerning the use of endrin. Quote "The President's Executive Order of February 8, 1972, greatly lessens the possibility of finding an acceptable seed protectant to replace endrin. This will continue to rule out direct seeding as a reforestation practice and reduce our total seed requirements." Unquote.

Planted seedlings are coated with repellants, which have a limited lifetime; also, as soon as seedlings begin to grow the new growth is browsed and in many cases preferred to natural reproduction. What amazes me here is the evolution in size of the seedling being used. Not long ago we planted large seedlings because we thought survival would be greater and also the environmental improvement could be achieved more rapidly. The rationalization was: the bigger the seedling the greater the survival and the shorter time the area would be covered with an adequate stand. Now we have started using plugs or bullets - it will not be long before we use the seed and probably spot seed. If our seeded or planted areas survive everyone is happy. But if grass, weeds or brush encroach on an area, another problem results. Previously we ran a ripper to tear up the grass sod and brush but this created another environmental problem. The grass and brush came in more vigorous than ever to the exclusion of the planted seedling, but to the attraction of rodents and deer. There is too much competition for the seedlings. We have (in 1972) been spraying grass with Atrazine, using 2-4-D plus water for weeds, 2-4-D and diesel oil for Ceanothus, and 2-4-5 TP and diesel oil for vine maple; we have sprayed a total of 1,064 acres of grass, 938 acres vine maple and 495 acres fertilized. Always being careful to stay away from water courses and homes. Generally, the use of chemicals contaminate the environment and can cause damage to natural life systems and people or animals in treated areas. A suggestion here is to be absolutely sure, before using chemicals, that all other methods of control have been explored. The use of chemicals should be a last resort.

Another item of forest development is precommercial thinning. There is a considerable amount of acreage that has trees in stands ranging from 10 to 30 years and some as old as 40 years, where wood growth has decreased to a bare minimum. These stands contain stem counts on an acre basis which varies from a few to several thousands. These stands already constitute an environment but one which we do not desire. So we manipulate it, and the justification is to increase growth per unit area. To protect the environment we intend to attain, felled trees are not to litter major water courses. Roads are to be kept clear, etc., and, depending on whether we wish the public to see the area or not, we can screen off the area with an uncut strip of trees. At any rate, we have disturbed the aesthetics for several years, for if the area was thinned by mechanical means the

floor is littered with stems and slash. Another consideration is we have created an environment during the first year of an extreme fire hazard. If we thin chemically then another different picture of the environment is had. Instead of having litter to clear up, what remains is a large number of dead or dying trees, or in some cases, trees that have recovered from this treatment will result in distorted stems.

(The Eugene District chemically treated with silvisar 500 an area of approximately 40 acres five years ago. Within 3-4 weeks the tops died. On a recent inspection a large proportion or the treated trees were vigorous and living. The frill wounds had healed and height growth and vigor were very good.) Other environmental considerations of chemicals used in thinning is the toxicity to man and animals and the probability of washing and leaching into water courses. Because of these uncertainties the district has received no go ahead signals on usage of chemicals for thinning.

Next comes fertilization. Fertilization, like brush and grass spraying differs from the usage of chemicals as in PCT. Where with PCT the chemicals are locally applied to individual trees, fertilization and spraying is done from the air. Proper climatic conditions must be had and the time of year must be considered for the work to be adequately done. The most important consideration of applying fertilizer is the environmental impact on water quality. Some work is being done and has been done in monitoring water courses adjacent to the treated areas.

After PCT, fertilizing and spraying will come commercial thinning in later years. Hopefully, this will be the case. At any rate another change in environment will take place. Probably additional roads will be required. Probably the pressure of aesthetics will have increased rapidly over what it is today.

If the demand for wood fiber has increased tremendously, then the need for commercial thinning will be lessened. At this early age it is possible clearcutting will be used. There again environmental considerations will be tailored to the time and need.

Primarily, in considering environment as related to commercial thinning at the present time, there is a need to protect the area so that the aesthetics will not be deteriorated. This is especially true of viewable areas. Those areas more remote fall under the category; if they cannot be seen then a minimum of environmental considerations are acknowledged. Other environmental considerations of commercial thinning would be minimum erosion and minimum loss of soil base, minimum effect on water quality, and minimum damage to remaining trees.

It is possible that we may have more than one commercial thinning over the life of the stand and, if so, projected further into the future the pressure of environmental consideration may become more intense.

After the last commercial thinning we come to the remnants of the stand which will be clearcut again as was in the beginning with the virgin stands. But happily under these remaining trees reproduction will have started and some of the environmental considerations mentioned at the beginning of the talk will have been minimized, such as with forest rehabilitation, brush control, grass control, etc.

In the final analysis there will always be a disturbance of ecology and environment and the primary consideration is, of course, not to change or upset the environment drastically. If on occasion there has been a drastic change in environment caused by the activity of man then all possible means should be utilized to restore it. At any rate, established guidelines, common sense, and good judgment should be the foundation upon which to rely and to build.

Criteria for Clearcutting in Proposed Presidential Executive Order

Section 3. Limitations on the Use of Clear-cutting.

(a) In order to ensure that timber harvesting on the public lands will be consistent with maintenance and enhancement of the environmental and resource values of those lands, and except for limited experimental and research purposes not associated with commercial timber sale, the respective Secretary shall not permit clear-cutting on public lands except under the following conditions:

(1) Clear-cutting for the particular species and specific area in question must be a silvicultural necessity.

(2) No area will be clear-cut where there will be unacceptable impacts on scenic beauty.

(3) Clear-cutting will not be used on sites where slope, elevation, and soil type, considered altogether, indicate severe erosion may result.

(4) No area will be clear-cut unless there is assurance that the area can be regenerated promptly. This determination will be based on a consideration of the species of trees and other vegetation site characteristics, soil type, slope, available moisture, frost characteristics and exposure.

(b) If the conditions of (a)—(4) have been met, clear-cutting in the particular area will be further constrained by the following limitations:

(1) The area to be clear-cut will be kept to a size that will minimize harm to the biota and will maximize total resource management benefits. In determining the size of the area, attention will be given to the effect of size on the necessary amount and location of road construction.

(2) The area to be clear-cut will be selected and planned to minimize adverse impact on existing or projected intensive outdoor recreational use.

(3) To minimize aesthetic impact, clear-cut areas will where possible be shaped to blend with the landscape.

(4) Adequate precautions will be taken to assure protection of water quality and biological productivity in neighboring streams and lakes.

(5) The area to be clear-cut will be selected to avoid severe impacts on wildlife habitat and diversity of species.

(c) The respective Secretary shall develop and publish in proposed form within six months, and adopt within one year, guidelines for the detailed implementation of the restrictions in subsection (a) and (b) in each of the major regions of the United States. These regional guidelines shall reflect the geographic, climatic, and ecological differences among the regions.

ENVIRONMENTAL CONSIDERATIONS IN FOREST DEVELOPMENT PLANNING

I can't say we have any unique procedures or policies regarding environmental awareness for forest development projects. Ten or twelve years ago we learned the hard way that herbicide sprays drift off-target. Once we got a man's apple orchard and once we got a snag faller. The latter incident was amusing because this faller was the type of guy you stand upwind from. He stopped our project forester and asked, "What am I going to do?". Our alert forester replied, "Why don't you try taking a bath."

Nowadays we don't make mistakes like that....(tongue-in-cheek).... We were so careful watching the helicopter last year that a barrel got punctured on the supply truck and the goop all ran out. Luckily the truck was parked and on a ridge top not near any water courses. So I think we're still learning and maybe we always will be. And I'm not sure that's bad.

However, what concerns me more than the obvious are the subtle effects of actions like mechanical precommercial thinning. When we finish we leave a mat of criss-crossed trees which cannot be penetrated by deer and elk. The area then is not available for escape cover when we clear cut adjoining tracts. This mat may also become a perfect home for our friends the mountain beaver and brush rabbit. It may serve, too, as a home for disease and insects.

Or how about the effect of herbicide treatment on wildlife food supplies. The Oregon State Game Commission is concerned about this. Last year in Coos Bay they only looked at maps in the office. This year they made a field inspection with our men to look at specific tracts. I understand a study on this is being made in Eugene so I hope some early answers are forthcoming.

That's all I have to say.

FOREST DEVELOPMENT WORKSHOP

PROCUREMENT CONTRACTING

Bernard J. Mayer

Earlier in this Workshop we heard Art Zimmerman, Hans Hess and Karl Bergsvik relate to the importance of the forest development program to the allowable cut plan. Forest development activities have to support the allowable cut and it is our job to carry out these activities.

If successful land treatment activities are an important part of the allowable cut plan, we cannot afford a contracting system where procurement rules and procedures take precedence over management needs when land treatment deadlines mean the difference between success or failure.

In the afternoon our panel got together to duscuss what we were going to talk about this evening. Our discussion covered a variety of problem areas and I will try to highlight some of them.

The basic problem as I see it from the district standpoint is that forest development projects all involve some form of land treatment and land treatments are tied to seasons of the year, special climatic conditions, or a series of special climatic conditions; one dependent on the other. Our contracting procedures call for a minimum of 8 weeks from the time our request gets to PSC until we have a contractor ready to start work. (PSC Instruction Memo No. PSC-72-02) Add to this 8 weeks, another week at the minimum to clear the Forestry Division and Division of Administration in the S.O. This required lead time creates problems in setting up projects in forest development activities.

The first planting bid is an example of this. In order to plant high elevation areas, a contract in hand is needed by November 15th. According to lead time requirements of PSC the request for bid invitation should leave the District the first week in September. At this date we have no idea which high elevation units will get slash burned or if they do what success will be achieved in additional area plantable. Our discussion concluded there was no way to shortcut the required lead time to correct this situation.

Two possible solutions were discussed which sould be pursued at a later date. One was to advertise early planting units yet to be burned as conditions exist at time of request for bid invitation and then send out an amendment a week before bid opening describing the unit after slash burning. The second possible solution was to let an open-end contract for the early bid. Only other alternatives are to let the units lie idle for a year or Force Account Plant.

Aerial spraying of grass and brush is another problem area relating to timing. Unless the spraying is done by specific dates the chances of the spraying being effective are greatly reduced. To insure the spraying to be effective a start work date of March 15 has been stated in requests for bid invitation. Because tree planting projects get shifted due to weather conditions, tree seedling underruns and overruns, specific units needing grass or brush spray cannot be identified the needed 9 weeks before the actual spray date. The result is spraying getsdelayed. Roseburg's spraying didn't start until April 10th and Salem's until April 18th this year.

A possible solution to this problem discussed was that requests for invitation to bid on spraying be sent in without identifying specific units to be sprayed. Contractors never look at the units anyway. All they're interested in is total acres to be sprayed. Requests for IFB need only list approximate acreage, units, and general distribution. With this procedure, request for IFB could be sent in in early December, which is early enought to meet the March 15th cut-off date.

Another similar timing problem occurs with aerial fertilization. Late Spring fertilization can cause nitrogen loss by warm temperatures volatilizing the fertilizer. This problem was solved earlier when Dick Miller stated aerial fertilization is equally effective when applied in Fall, Winter, or Spring. I suggest from now on, we let our contracts in the Fall with an early Spring cut-off date.

Another problem area concerns performance times in request for bid invitation. At times, Districts don't give adequate thought to this, along with specifications. Undue delays occur when Districts do not have their requests in proper order. PSC on occasion has changed performance times and required simultaneous performance on multiple bid items when it was not the District's intent to do this. Further discussions should take place on this item.

FOREST DEVELOPMENT WORKSHOP

TREE SEED PROCUREMENT

by Bernard J. Mayer

My portion of this panel will pertain to problems with present contracting procedures. Of course, the main problem has been the lack of performance on the part of the seed dealers.

Our tree seed procurement contracts are referred to by the seed dealers as "Clean Seed Contracts." The contract is a supply contract where payment is based on the delivery of pure, live seed, by a specified date. This last Fall's contract and the one in 1968 required delivery of origin certified seed (yellow tag). Delivery of seed under these two contracts as you all know, left a lot to be desired. In 1968, Western Oregon wide we had 58% delivery; Roseburg 30% and Coos Bay 0%. The contract last fall had 50% delivery for Western Oregon; 58% for Roseburg, and 38% Coos Bay. I don't have the figures on the other districts, but I'm sure they fall within the same degree of performance.

On February 1st, I had an opportunity to attend a meeting of the Northwest Forest Tree Seed Certifiers Association in Portland. State Office and Portland Service Center representatives were also present. This meeting of seed certifiers, seed dealers, and seed buyers, was called to discuss problems relating to the 1971 cone crop harvest. It was a frank and open meeting. A copy of the minutes of this meeting was sent to all the districts and should be available for all of you to read.

From what I learned at this meeting and our experience in Roseburg this last fall with the seed contract, I would like to go over some of the reasons for the lack of performance in our seed contract.

First of all, our seed contract is a typical government contract; i.e., low bidder award with no provisions for throwing out the lower bidder. Bid price per pound this year from $13.38 to $13.88 on 46 different lots in four BLM Districts doesn't appear to be responsible bidding considering cone crop accessibility, quantity, etc. I question whether a supply contract is proper for forest tree seed procurement. Supply contracts are for supplying goods and materials. Normally these goods or materials can be supplied from a domestic or industrial source. In the case of our tree seed contracts the successful bidder has to come to us for the raw material since we geographically control the cone supply.

One very important reason for non-performance is the lack of penalty for non-performance, especially during the cone picking period. Last fall our seed contractor had only two cone buying stations in the whole District. Both buying stations were on the west side of the District and cone pickers were expected to drive 50-60 miles to sell cones from some lots on the east side. Without stiff penalty clauses and performance bonds the seed dealers will only fill orders in those seed lots where cone supply is bountiful and effort needed to gather cones is minimal. Without proper controls the economic motivation called profit margin rules.

Not all the blame can be put on the seed dealers. Our IFB on seed contracts have been coming out too late for seed dealers to organize and check out cone crops properly. There is generally a lack of communications between seed dealers and seed buyers at the field level. The seed dealers would like to know our seed need by July to organize properly.

Generally speaking, most Districts don't have experienced personnel who know what to do when there is a cone crop. Cone crops come only every 3 - 7 years and most people are not in the forest development game long enough to experience more than one cone crop. More basic yet is the lack of experience in making cone surveys and evaluating cone crop. Training and guidance from the experts is needed.

One last reason for failure neither the seed dealer nor we have any control over and that is an unexpected dry east wind that dries out and opens the cones unexpectedly.

In my opinion the outlook for clean seed contracts is bleak. Most seed shortages are in Zones and Elevation bands which historically have been poor cone producers, either because of poor crops or lack of good young stands to pick. These zones lend themselves to Force Account picking.

With the loss of aerial seeding, large seed inventories are no longer needed. Small lots 20# to 50# of seed do not lend themselves to clean seed contracts.

Wild seed will be replaced by selected seed from known parent and finally by superior trees from seed orchards in 10 to 20 years.

Seed dealers can only depend on income every 3-7 years for lack of a pickable cone crop although at this time they express interest in providing BLM and other agencies with tree seed.

SEED PURCHASE PROBLEMS OF THE SALEM DISTRICT

BY

DANIEL R. MADSON

THE PRESENT SYSTEM FOR TREE SEED PROCUREMENT DOES NOT ADEQUATELY PROVIDE THE TREE SEED NECESSARY TO FULFILL ALL THE NEEDS OF THE SALEM DISTRICT. WITH 13 ZONES AND UP TO SEVEN ELEVATION LEVELS PER ZONE, WE HAVE TO CONCERN OURSELVES WITH 75 DIFFERENT SEED LOTS FOR DOUGLAS-FIR AND WHEN YOU CONSIDER OUR NEEDS FOR NOBLE FIR, WHITE FIR, SILVER FIR, WESTERN RED-CEDAR, ETC., WE COULD BE TALKING ABOUT WELL OVER 100 LOTS.

AT A RECENT MEETING WITH TREE SEED DEALERS, WE WERE TOLD THAT THEY COULD NOT BE EXPECTED TO BID ON TREE SEED LOTS OF LESS THAN 100 LBS. OVERHEAD COSTS AND THEIR INABILITY TO INTEREST PICKERS IN SMALL LOTS MADE IT ALMOST IMPOSSIBLE FOR THEM TO PRODUCE THE NEEDED SEED FOR THOSE SMALL LOTS. ONE DEALER DID INDICATE THAT THE ONLY TIME HE WOULD CONSIDER BIDDING ON SMALL LOTS WAS WHEN HE HAD OTHER ORDERS FOR THE SAME LOT BUT IN NO CASE WOULD HE BID ON ORDERS FOR UNDER 50 LBS. OF SEED.

IT WOULD BE NEXT TO IMPOSSIBLE FOR THE DISTRICT TO BUY SEED FOR ALL THE POSSIBLE COMBINATIONS OF SEED LOTS, EVEN IN A GOOD SEED YEAR, NOR IS IT POSSIBLE TO ATTEMPT TO MAINTAIN AN ADEQUATE FIVE-YEAR INVENTORY OF ALL SEED LOTS.

THE ADMINISTRATION PROBLEMS ON ANY CONTRACT CONTAINING ALL OR MOST OF THE POSSIBLE TREE SEED COMBINATIONS WOULD BE OUT OF THIS WORLD. EVEN SPOT CHECKING OF PICKING AREAS AND BUYING STATIONS IS DIFFICULT TO SAY THE LEAST. IT IS NO WONDER THAT THE FIELD FORESTER HAS LOST FAITH IN THE SYSTEM.

FACED WITH THIS PROBLEM, WE HAVE ATTEMPTED TO DO THE ONLY PRACTICAL THING WE COULD DO. THAT IS TO PURCHASE SEED IN LARGE AMOUNTS (100# PLUS) AND ONLY FOR THOSE AREAS WHERE THE SEED DEMAND IS HIGH ENOUGH TO MAKE IT WORTHWHILE. MAYBE WE HAVE TO DO A LITTLE PRAYING AND JUST HOPE THE SEED IS FROM THE RIGHT AREA OR THE SAME AS THE TAG SAYS IT IS.

WE KNOW THIS HASN'T SOLVED OUR PROBLEMS NOR HAS IT GIVEN US ALL THE SEED THAT WE NEED. WE HOPE THAT THIS MEETING AND DISCUSSION WILL GIVE US SOME ANSWERS TO HELP SOLVE THE PROBLEM.

SOME SUGGESTIONS FOR OUR CONSIDERATION ARE AS FOLLOWS:

1. UNTIL SUCH TIME AS THE SEED ORCHARDS CAN PRODUCE THE REQUIRED SEED, WE SHOULD CONTINUE TO PURCHASE SEED FOR THOSE ZONES AND ELEVATIONS WHERE THE DEMAND FOR SEED IS HIGH ENOUGH TO BUY IN 100# LOTS.
2. IN ADDITION, WE SHOULD CONSIDER ENTERING INTO SOME COOPERATIVE SEED COLLECTION VENTURES. SOME OF THE LARGE LAND OWNERS HAVE LET CONTRACTS FOR PICKING IN CERTAIN AREAS AND THE PURCHASE OF CONES (OR SEED) PICKED FROM THEIR LANDS--PURCHASE ALL CONES JUST AS LONG AS THE ELEVATION IS MARKED.
3. FOR THOSE AREAS WHERE OUR SEED NEEDS ARE MINIMAL, WE SHOULD CONSIDER FORCE ACCOUNT CREWS FOR CONE PICKING OR SMALL NEGOTIATED CONTRACTS FOR CONES.

THE COOS BAY HOMOLAC SEED PRODUCTION AREA

HISTORY

The Homolac Seed Orchard was established in 1964. Its elevation of 1000 feet and approximate central location in the North Area make its seed crops ideal for a large majority of the North Area planting projects. The average age of the selected trees was 19 years in 1965, indicating that they resulted from the bonanza seed crop of 1946.

First cones were collected in 1965, a poor seed year.

CULTURE AND COSTS

Development work was done on approximately 45 acres by two BLM foresters and a BLM force account crew. Work accomplished included thinning of the area, burning and chipping of the thinned material, fertilizing of 48 selected trees with 14 lbs. each of 16-20-0[1] and road building. Cost of development work was approximately $200/acre.

Cone collection to date:

Year	Bushels of Cones	Pounds of Seed	Picking Labor
1965	44	14	BLM Force Acct.
1966	300	278	BLM Force Acct.
1971	416	non known	Local Contract

---

[1] 16% of Ammonic Nitrogen (320 lbs./ton)
20% of Available Phosphoric Acid (400 lbs./ton)
14% Combined Sulphur (280 lbs./ton)

Note: Cost of collecting cones and processing seed for the 1965 crop was $34.77/lb., as compared to average cost of seed obtained from commercial sources that year of $12.87/lb. This wide differential in cost can be attributed in part to the large difference in volume. Obtained from the production area was 117 pounds and from commercial sources 8,877 pounds. As experience is gained in collection procedures and cone production is increased through cultural practices, costs should be lowered substantially. This was our maiden effort at cone collecting and not a good seed year.

Even a five-fold variation in comparative costs would be entirely acceptable when viewed from the standpoint of sound forestry principles. (meaning: viable seed from a known source and picked without damage to the trees).

IMPROVEMENTS

In April, 1971 the seed production area was fertilized with an aerial application of 440 lbs. (200 lbs. N.) and 225 lbs. of treble super phosphate (100 lbs. P_2O_5) per acre. This was part of a 211-acre project.

PLANS

Future plans include thinning and some needed road improvements.

Note: Information we have received from a BLM forester said that in some old-growth stands in the Burn Mtn. Unit, the 1971 seed crop was equal to the 1946 crop.

Coos Bay South Area has collected cones in 4 different seed collection areas, I believe, however none of these areas have been as well developed as the North Area Homolac Area.

IN REPLY REFER TO:

UNITED STATES GOVERNMENT

Memorandum

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
District Office
P. O. Box 392
Eugene, Oregon 97401

DATE:

TO : Forest Development Workshop

FROM : Larry Held, Eugene District

SUBJECT: Tree Seed Procurement, District Seed Status and Outlook, and A Look at the Lorane Seed Production Area

Presently the District has an Inventory of a total of approximately 5,000 lbs. of seed representing 9 zones, 8 elevations, 50 collection lots, and the collection years from 1962 to date.

We intend to surplus old uncertified seed as soon as the market allows, but still keep approximately half of this amount for unplanned disasters such as windstorms, fires, etc. The District will need to procure about 500 lbs. over the next 5 years from contract collection (depending somewhat on what happens to direct seeding.)

We propose the contract collection of cones under a joint agreement with the private timber companies. By this method we attempt to overcome such problems as having cone collectors cutting tops out of trees. This is what the District experienced in the past. The better control comes from the companies having roads that are well gated.

The Lorane seed production area has produced its first major cone crop in 1971 with a total of 800 bushels of cones collected. This was only half of the estimated crop. This will meet our need for seed in this coast zone for 5 years or until the next crop of cones. With a cost of $9,000 in 1965 to establish this 30 acre area it can already be considered a very successful venture.

SEED COLLECTIONS FROM WILD STANDS

Between August 30 and September 17, 1971, the Medford District Rust Resistant Pine field crew collected about 67 bushels of Douglas-fir cones in the Medford and South Roseburg Districts. Forty-seven man days were used and the cost was about $1,800 for the forty-four pounds of clean seed obtained. These special collections were made from over thirty of our plus trees, some alternates and a random collection from each stand around the plus tree. The cost of the cone collection was approximately $41.00 per pound of seed. This open-pollenated seed is to be used to grow the half-sib root stock needed at the Charles A. Sprague Seed Orchard and for establishing the initial plus tree test plots, with any surplus going to the two districts' reforestation programs.

The trees from which collections were made ranged from 16" to 36" D.B.H. and from 40 to 196 feet in height. The elevational range was from 1200 feet to 5500 feet. The job was completed in 14 working days with 3,000 miles of travel.

The crew consisted of four men with two vehicles. The crew members had a minimum of five months climbing experience just prior to starting the project. Equipment in each of the vehicles included a set of Swiss tree-bicycles, 18 feet of magnesium ladders in six-foot s-ctions, safety belts, nylon safety lines, pruning saws for climbing, wire hooks for pulling in limbs and burlap bags for the cones. One crew preferrred to bag the cones as they picked and the other to drop the cones to the ground and pick them up. There was very little difference in total time involved, but safety factors certainly favor dropping the cones to the ground, especially from the larger trees.

Costs of the project were over four times that of normal contract Douglas-fir cone collections, but we now have an excellent opportunity to test the assumption that positive identification of seed source is worth a great deal of additional cost. We need only to use some ordinary planting stock in our tree improvement test plots as controls. It will take only a very little increase in survival of added growth to make up the difference in initial seed costs.

From last year's experience here are some ways I believe we can bring our force account Douglas-fir seed collections into a more competitive position:

1) Make long range plans for tree seed collection.

Cones cannot be collected economically from standing trees unless the crop is at least moderately heavy so we must be ready with properly trained people and good equipment to collect the cones in good seed years and store the seed as a reserve for the lean years.

2) Select young stands in advance for seed collection in areas where the seed is to be used.

The stands should be natural ones, of good vigor. Then they should be thinned and pruned if possible. In order words, set aside more seed production or collection areas to be used until seed-orchard produced seed is available.

3) Estimate the cone crop potential.

The cone crop should be evaluated early each spring season and checked periodically during the summer. Look for cone and seed development, seed set, insect damage and over all quantity of cones before making the final commitment to harvest.

4) Collecting the cones.

a) Make sure the cones are ripe! The lower elevations in western Oregon below 1000' elevation are usually ready by August 25, but this will vary by year, locality, and individual trees, so check several samples from each area before harvesting starts. Picking can proceed to the higher elevations at about a thousand feet elevational rise a week.

b) The safest, fastest way to the lowest five limbs of a good cone bearing tree is by ladder (except, of course, if you have to pack it a long way in the brush). If the live limbs cannot be reached by ladder, then climbing spikes or the Swiss tree-bicycle can be used. These are usually much slower and therefore more costly than the ladders. The Swiss tree-bicycle is a safe tool and does not damage the tree stem, but all limbs must be removed up to the live crown. If the trees are semi-permanent seed producing ones, placing pole steps in them from ladder height up to the crown can speed up climbing a great deal, damage to the tree is minimal.

c) Truck-mounted aerial ladders can be used along road sides and in roaded seed production areas and in many instances will cut production costs considerably.

d) In England they have adopted a system of rigging a large triangular twelve-inch mesh nylon net in larger trees which bear small sized cones through out the crown, such as hemlock, Douglas-fir, and cedar. The pickers climb on this net and by fastening the safety belt directly to the net may use both hands to pick and place cones into a bag.

e) Finally, the least expensive method is to collect cones from trees that have been felled for harvest. Although timing is a problem, we should take full advantage of this method if at all possible.

PANEL DISCUSSION - PLANTING SURVEYS

In planting an area our basic policy is to obtain a satisfactory job within a reasonable time. The inspectors strive to spend as much time on each unit as they can. They are on each unit for at least one day of planting time; many times the inspector is more than observation; he is responsible for maintaining a high quality planting job. Since the inspector spends so much time on each unit, the formal planting survey is somewhat redundant.

We believe that the manual is a guide and not the absolute law; therefore, we deviate from it when we believe it doesn't cover our individual situation. Many tree planters do not plant the units in an "orderly" fashion. They may utilize a planting method known as "floating", or they may plant a unit in segments, none of which are uniform. Neither of these methods lend themselves to the strict manual method of planting survey. The inspector then modifies the survey to fit the unit.

We don't usually use a systematic survey of parallel lines. We use the timber sale Exhibit "A" or the 1" = 1,000' type maps as they are of sufficient size and detail for our purposes. We take at least one plot per acre and test the tops and roots of every tree. The plots are established at a constant interval along the survey lines.

This survey is taken as a part of the inspector's log. This log is made out for each time the inspector is on the unit. All actions he takes and all action the contractor takes are recorded.

While, when we are about to take a formal survey, the contractor is invited to participate in the survey, they very rarely go along. However, when we have never worked with a contractor before, we strongly encourage them to come along. We believe that, if they can see how we take the survey and what we consider a properly planted tree, we can avoid a great many problems. We have managed, by our presence on the job, to maintain a high quality planting job and a low penalty.

Stocking Surveys

The state manuals as well as most district manuals require us to make stocking surveys of all planting areas, so we do our surveys, fill out some forms and deduct a penalty from the payment to our contractors. These planting surveys give us useful information to be used in order to obtain higher quality in our planting.

We use this information to show the contractor his mistakes and correct them. We use the stocking surveys to check ourselves. The instructions we give the contractors are based on the survey information. No matter how experienced we become it is difficult to determine correct spacing in all areas, without using surveys.

The instructions in the state manual represent the best method for obtaining a statistically sound sample. This is important, especially in the case where a penalty or nonpayment is taken to court. Any variations from the manual locating plots will put personal bias into the sampling process, no matter how objective the contract inspector tries to be.

The methods described in the manual present problems which make their use difficult if not impossible. First, it is impossible to have straight lines intersect a series of random curved lines at a 90 degree angle. Planters often plant in rows that go around the unit or they float over areas not using rows at all.

Laying out lines on a map requires the whole area to be finished before a survey can be done. After an area has been planted it is too late to correct mistakes since the contractor has moved to another area and would probably rather take a penalty than to come back and replant.

For these reasons it is common for contract inspectors to take plots for their surveys directly behind the planters. This could lead to problems if a contractor decides to challenge a penalty.

In order to resolve the conflicts in survey methods I propose the following:

> Plots should be taken behind the planters in the most random method possible. Only one plot per acre is necessary in the survey. The results are used to obtain the best job possible.
>
> In case an acceptable job is not obtained and there will be a high penalty, non-acceptance or a complaint by the contractor, the total area should be resurveyed, using the methods outlined in the manual exactly. Two or three plots should be taken per acre in order to give a closer estimate of actual conditions with high confidence.
>
> If the inspector works closely with the crew the intensive surveys should seldom be necessary and the Bureau will get a good job which is far more desirable than high penalties.

/S/ Alan Schloss

Gray Wittmeyer

PLANTING SURVEYS

I note that much of my material has already been covered by Snedaker, Schloss and Watts, and very capably, so I will skip around and tell you about some random thoughts related to our planting of this past season.

In an effort to test the practical approach to checking trees and spacing on the same survey line, I rand a line in a unit with heavy slash and brush. I required two to three hours to run 66 plots, of which only seven were plantable! In other words, it is often the only practical method to dig trees where you know you can find them, as long as each planter's work is sampled, then check spacing in other parts of the unit.

We found that planting by the acre isn't a sure cure for tree hiding. We learned that the contractor who did almost all of our planting this past season was paying $3.00/hour and requiring 800 trees per day, plus a bonus of 3¢ per tree for trees planted in excess of 800. Don Martin found a full bundle buried. I located 23 trees cut in half and partly buried, and another 10 hidden under a slab of wood.

In such cases the government loses the cost of the trees, but the contractor takes the major part of the loss - so his foremen do their best to prevent tree hiding. We still feel that the acreage payment basis of planting is preferable.

Our major contract in the North Area of $45,000 plus, and the one in the South Area for a slightly higher total represented by far the highest contract amounts for planting ever reached in the Coos Bay District. We feel that large contracts reduce our problems of contract administration.

CLOSING. Tell story of the tree planter who worked all week without rain gear. He didn't show up for work on the following Monday so may have been ill. He surely should have had pneumonia!

I'm convinced that the foreman had despaired of achieving any success in his efforts to teach Nick how to plant an acceptable tree.

At about 2:00 P.M. of a miserable January day with alternating periods of snow and rain, I was down on one knee attempting to show Nick how to smooth and clean the hole with a final stroke of his planting hoe. His beard was wet and his uncovered locks were wet and I'm sure that he was pretty well soaked to the skin. He watched me for a few moments, then came out with, "I've never realized until now that planting could be an art form!"

Planting Surveys

Procedure

In Roseburg, in general, the small plot system of sampling is used. The plots are taken at one chain intervals on a straight line transect. If necessary, parallel transects are established at no less than three chains apart. These transects are arranged in a manner which will provide a good cross section of conditions within the unit. No set number of plots is established, however, at least one planted tree is checked per acre of area within the unit. A stick of the length of the plot radius is used for reference.

Technique

The inspections are performed as follows:

1. The tree is examined to determine if it has been planted properly. in regard to site, depth, etc.

2. The seedling is checked for tightness by a light pull on the stem. It is not considered necessary to pull the top whorl of needles loose in this test.

3. Using a hand trowel, the handle of which has been marked at eight inches (an innovation of Conn's, I think) the soil is dug to a depth of eight inches, about two inches from the stem of the tree. The soil is then tested for tightness around the roots by thrusting a finger into the soil toward the roots near the bottom of the hole. If the soil caves in too easily, an air pocket is indicated.

4. The soil is then carefully crumbled away from the roots and a determination is made as to whether or not the roots have been properly bedded. The tree is then replanted properly. Any discrepancy along the way negates the necessity to continue testing a single tree.

5. Each plot should have one tree. Two trees do not constitute a spacing penalty - three trees do. A plot may have one or more natural trees as well as a planted one if it is determined that the naturals are not healthy or may not have been seen. One natural, if it looks healthy in a plot, may count - not as a planted tree but as a stocked plot.

Comments

We always check an area as soon as possible after planting. Also, whenever possible, we start with the planter and inspect his planting at the beginning to inform him of any problems he can correct as planting progresses.

I have one complaint about the considerations allowed for in penalty computations. A spacing penalty may be slight although 20 percent of the plots examined had no trees in them. This is not too serious in itself, however, usually the discrepancy is concentrated in one area. In other words, if there are no other penalties, a solid block amounting to 20% of the unit may be unplanted and this is not reflected in the penalty which may be as low as 6 or 7 percent. Some provisions should be made here to penalize the planter without applying the lower confidence factor.

We try to encourage the planter to plant microsites and will alter our survey on the ground, to a point, to compensate for it.

ENVIRONMENTAL CONSIDERATIONS IN FOREST DEVELOPMENT PROJECT PLANNING

James Conn ------- Roseburg District

In preparing for this topic I talked to the people concerned with Forest Development in the district. I was left with this question - 'What is an environmental consideration?' To the backpacker in the high country it mean- one thing, to the birdwatcher another. Too often we in Forest Development feel it means that the timber sale crew did a poor job, to the sale crew a field of grass equates to the rehaber being asleep in his rig. So, to the problem at hand.

The Bureau is adequately covered with various manual releases, instruction memos, etc., on the subject of protecting the environment so I will not detail those existing instructions. In Forest Development the obvious environmental considerations are herbicides and pesticides. Since we are now limited in the use of them, i.e., 2-4-5T, Endrin, MSMA, etc., no more needs to be said except when using these, we are authorized to use good judgement, common sense, and the almighty buffer strip shall prevail.

We in Roseburg feel that there are other, perhaps more subtle, things that should be included in the phrase, 'Environmental Consideration.'

Take planting as an example. Is the continued practice of planting pure stands (Douglas-fir, ponderosa pine, etc.) a good environmental practice? Possibly we should be putting out more effort to replace a mixed stand with another mixed stand through the use of minor species, such as incense cedar, western red cedar, and hemlock.

In the field of precommercial thinning we think that the choice of thinning method, mechanical or chemical, the spacing of leave trees and the possible logging techniques of the future, are considerations that affect the environment. A case in point is the questioned ability of wildlife, particularly big game, to move about with ease after a mechanical thinning. In forest fertilization we, as project inspectors, must assure that water quality is protected by using buffer strips of whatever width is necessary to keep the fertilizer out of water courses.

In Roseburg we have been planting hardwoods along stream banks to provide shade in an attempt to keep water temperatures down to a level the fisheries people will accept. We are not sure this is occurring but feel now is the time to start trying. We can always modify the procedures if proven wrong.

The requirement in all land treatment contracts to clean-up all garbage and trash that resulted from the contract or working there is a good thing and should be followed up on all contracts. Score another one for Johnny Horizon!

I think I have left the most important environmental consideration until last - the problem of slash disposal. Every one of us here has had this crop up to one degree or another. With the smoke control requirements, we in Roseburg are experiencing more and more slash to contend with a planting time. We should start now to try new and innovative programs to contend with this slash. One such program that could be explored is to take the dollar value allowed in the timber sale for slash disposal and apply it to site preparation, possibly an allowance to the planting contractor to provide a man with a power saw to cut slash out so trees could be planted in areas of heavy slash. The possibility of force account slash burning could also be looked into.

In conclusion, it seems that about anything we do in forest development is affecting the environment in one way or another, so we must always be alert to changes in our reforestation area in vegetation and animals that may indicate that the environment has been changed. Fortunately for the rehaber, usually the final outcome of forest development is an improvement to the environment over what he had when he started.

ENVIRONMENTAL CONSIDERATIONS IN FOREST DEVELOPMENT

We are required by policy and regulation to make certain environmental considerations in forest development. I will briefly cover the framework of these and how they relate to us. Starting with Salem District policy, I will read parts of our Management Framework Plan: --

I. Environmental Protection in Natural Resource Management

Public concern for a quality environment and recent environmental laws require all natural resource management actions include measures to protect the natural environment. Indeed, environmental protection is embodied in public law and Executive Orders to such a degree that economic criteria and public need are no longer, of themselves, adequate justification for a natural resource management decision involving public resources. Every decision must be predicated on sound environmental policy.

Multiple use management of the natural resources administered by the Bureau must, therefore, provide for the integrity of the environment and assure the ecological soundness of every field action. Support activities - road building, spraying, construction of facilities, etc. - must also respect environmental quality. The Bureau is guided in this area by a variety of public laws, E.O.s, and Bureau guidances - manual releases, instruction memos, etc.

A. Standards Prescribed. The Bureau must constantly assess its present and proposed programs, activities, demands, uses and technologies to assure their consistency with the objectives of protecting and enhancing the environment, which requires at least the following standards:

1. Water quality shall be maintained at, or improved to, standards which meet or exceed state and Federal standards.

2. Air quality shall be maintained at, or improved to, standards which meet or exceed State and Federal standards.

5. Pesticides and herbicides shall be treatments of last resort, to be used only when reasonable alternatives are not available and their use is consistent with protection and enhancement of the environment. Where pesticides and herbicides are used, the type, amount, and method of application will conform with State and Federal standards and, in addition, will be planned for and applied with every possible precaution.

II. B. E.O. 11514 - Protection and Enhancement of Environmental Quality

2. Requires federal agencies to:

a. Monitor, evaluate and control their activities so as to protect and enhance the quality of the environment.

b. Develop procedures to let public know of our plans and have a chance to comment.

The National Environmental Policy Act requires an environmental impact statement in all cases where Federal actions significantly affect the quality of the environment. The statement must fully evaluate the environmental consequences of a proposed action and possible alternatives. This Act also establishes a "clearing house" procedure whereby state and local review is made when Bureau actions or proposals affect the environment.

The necessity of an Environmental Impact Statement is determined by first making an Environmental Analysis. This requirement is covered in Instruction Memo Oregon 71-491 dated November 9, 1971, which says in part --

> . . . an environmental analysis will be prepared for all project type actions undertaken by BLM in Oregon and Washington. Examples of these will include timber sales, recreation construction, S&W projects (e.g., spraying, construction projects), forest development projects, firebreak construction, road maintenance (e.g., spraying), etc. This will be done as early in the planning stage as feasible, but always prior to commiting the Bureau to some irreversible action.
>
> With the present public concern for environmental matters, we can ill-afford to take any Bureau action that has not been analyzed from an environmental standpoint. Until more detailed guidelines are issued for the preparation of environmental analyses and statements, be guided by the procedures contained in BLM Manual 1791.

This Manual covers Environmental Impact statements quite thoroughly but has only this to say about an Environmental Analysis --

> . . . Actions which have been analyzed for environmental impact but do not meet the criteria for preparation of a statement will not have statements prepared, but will have an environmental analysis prepared and made a part of the case file. These actions will receive periodic review.

I am assuming that an Environmental Analysis has the general outline of an Environmental Impact statement, but not the depth or detail.

I also have here a five-page list of Public Laws, Executive Orders, Instruction Memos, Information Memos and other guidance documents on environmental considerations. They illustrate how the Government has embraced this subject --under public pressure.

These environmental considerations are some of the realities we live with. I feel they are an essential part of sound forestland management.

Walter Gilde,
Salem District

ENVIRONMENTAL CONSIDERATIONS IN FOREST DEVELOPMENT PLANNING

by R. L. Todd

Since much of the basic information on this subject has been covered by the previous speakers, I will try to limit my comments to those things as they are done on the Medford District.

I. Pre-commercial Thinning

At the present we have done only a small amount of thinning and we find that from the viewpoint of planning, what we do has considerable impact on wildlife, wild fire potential, general esthetics from the public's standpoint, and potential insect infestations. Most of these cannot be completely eliminated by planning but they can be minimized by better or different practices.

II. Hardwood, brush and grass control

I have lumped these practices together as they are all vegetative manipulation and generally involve the use of chemicals. In Medford there has not been much hardwood or brush control since 1965. The feeling on the District seems to be that we will take a long hard look at any such proposals and only those that are definitely in need of release will be done.

There has been some grass control done and these areas have been kept fairly small with no large acreages in any one drainage at one time. The usual considerations of wind drift were taken into account.

III. Forest Fertilization

Since there has only been a small amount of hand fertilizing done in cooperation with the University of Washington, environmental problems have been small.

IV. Planting

Some of the environmental considerations in planning for forest planting include (1) any possibility of type conversion and if so the reasons for it, (2) exclusion of any minor species present and (3) the occurrence of any pathogens in the area such as Cronartium or Poria and what measures might be taken to reduce their impact on the next crop.

V. Predator Control

Since the recent executive order banning predator poisoning on Federal lands, we have not had the need to do any environmental planning in that area. Previous to this, however, when we had such a program, the main environmental items were (1) proper burying and

V. (continued)

or fastening of baits, (2) proper handling and disposal of baits, (3) making certain that the baits were hidden from view and (4) that all bait stations were visited regularly.

VI. Forest Roads

Although forest roads are not included in our "job description" in Forest Development the fact is that they are very much for the development of the forest. They hold the key as to how the future forest is to develop and improper road development has caused us many environmental problems later.

Many of the problems that have been created in the past could have been mitigated or eliminated by proper environmental preplanning. Amoung the elements of such preplanning are: (a) proper road location as to position on the slope, soils, etc. (b) proper road standard, not too big, (c) number of roads needed - As logging practices change so do the number and standard of roads needed. Right now in the Medford District we are yarding partial cut areas 1500' slope distance up hill and down hill with cable. Now here you have an instance where logging practices should affect our roads.(d) Culvert design and placement.(e) Surfacing and (f) mulching and revegetation.

VII. Timber Sales

Again, here is an area where we are not consulted on, at least not in the degree that I feel we should be. In the Medford District many of our reforestation failures have been caused by poor or non-existent environmental preplanning of timber sales.

Among the elements of good preplanning are (a) Should the area be clearcut or is a "partial cut" called for by visible indicators, (b) What is the size and shape of the cut area to be, (c) What effects will the overall timber sale have upon the esthetics, water, wildlife, and other resource values, (d) Is it to be a partial cut and what type of logging practice is to be used to remove the timber, cat or cable? (e) What effects will the logging have upon the residual understory, both coniferous and hardwood? (f) Soil management - What amount of disturbance can be expected and is it more or less than is desired? If it isn't quite what is desired, can you do anything to change it?

VIII. The Future

Some of the environmental problems we will be facing in the years to come will be: (a) Increasing urbanization and balkanization of private lands. How many 5 and 10 acre subdivisions have you seen lately next to O&C or P.D. lands? with this type of development and the resultant increase of people looking down our throats about our management practices, we must be sharper than ever in future environmental planning.

VIII. (continued)

(b) Pressures for multiple use. The overall game will not change but the pressure groups will become increasingly more well heeled and informed.

(c) Incompatibility of demands and goals.

(d) Increasing awareness and use of natural resources, both consumptive and non-consumptive by the general public.

(e) Shrinking commercial forest land base both private and public, will magnify the pressure on the remaining resources and will make even more imperative a good professional job of environmental preplanning be done at all times.

Let's not look at this as a menial task to be done grudgingly, but rather as an opportunity to be able to do a thoroughly professional job as a land manager.

Prepared by Medford District

VARIABLE PLOT STOCKING SURVEY METHOD

Background

The stocking standards set down for Western Oregon, which were received in November 1971, display much improvement over the previous standards we have had to live with in the past. These new standards, which vary according to site and age class, are ideal under ideal circumstances. Unfortunately, it seems that, many times, circumstances are not ideal. Assuming that there is no problem identifying the site on a particular unit and the "problem" arises as to which age class do we assign the unit. On clearcuts with only one treatment, age class assignment is easy but, in many areas of the Medford District where we are doing a lot of retreatments, many of which contain varying degrees of stocking of different age classes, it becomes quite difficult to assign one specific age class. A decision will have to be made that it will be run at one standard or the other, or possibly an average. If the unit is indeed comprised of differing age classes, regardless of the predominance of one or the other, the standard decided upon will be in error, even if it is an average.

Errors can be made rather easily since one will not know for sure which is the predominant age class until after the survey is made.

In order to overcome these problems, a modification of the survey method is needed so that each age class can be taken into account at each and every plot. This can be accomplished by a "variable plot" survey where each age class can be tabulated according to its respective plot radius. All guess work will be removed from the assignment of age classes and an accurate survey can be made revealing not only the total stocking present but it will also yield the present stocking by age class for each age class that may be present.

Method (Attached example)

A one-acre block was drawn to scale (1"=15') in which 100 marks were made of which 50 represented the 1-3 year old age class and 50 represented the 10+ year age class. The marks (trees) were randomly spaced throughout the one-acre block. On the drawn model, the age classes were color coded so their differences could be established in the analysis.

On this one-acre block, 21 sample points were established systematically. The survey lines were diagonal across the square area and were 45' apart. Four independent surveys were made utilizing the same points:

a. 8.5' radius - all trees counted.

b. 10.0' radius - all trees counted.

c. 12.0' radius - all trees counted.

d. Variable plot radius - all three plot radii used but only the trees in each age class were counted for their respective plot radius. (3 plots per point.)

The surveys were made in all cases using a Site IV as a base and utilizing the stocking standards and their respective plot diameters as spelled out in the new revision of Manual 5705.

Results and Analysis

The following list displays the percent stocking obtained through the use of the various plot diameters counting all of the trees within the plot boundary:

8.5' radius - 62%
10.0' radius - 76% (could be construed as an average radius)
12.0' radius - 91%

The variable plot, while tabulating only the trees in the age class for the respective radii, yielded a stocking of 72% of the 21 total points. This figure, although very close to the average of 76% listed above, is coincidence because of the 50-50 proportion in the age classes in the model. The following analysis can then be made.

38% (8/21)	of the plots had stocking at Age Class 1-3 yrs.
48% (10/21)	of the plots had stocking at Age Class 10+ yrs.
72%	stocking for the entire unit.

$$\left(\frac{15}{21}\ \frac{= \text{Total points with stocking}}{= \text{Total points}} \times 100 = 72\%\right)$$

Conclusion

The stocking obtained by the variable plot method is believed superior because it takes into account the fact that there are several age classes present and each is weighted accordingly.

The data obtained in this system by using the illustrated format allows us to determine the stand composition by age class which would otherwise be quite cumbersome to break out. This information could be valuable in determining needs for future surveys.

The variable plot principle herein described, or with some refining, could effectively be applied to partial cut areas.

This system is not any more time consuming than the stated method because under most field circumstances the conditions will be obvious. Where conditions are that there are no varying age classes, the system should still be employed so that when a person looks at the files and survey notes he will know for sure what the stand composition consists of. This will then, over the years, give us a good historical account as to how the stand developed.

We have used this system on some of our surveys on the Medford District and found it to be quite satisfactory. We, therefore, recommend that this system be utilized on a statewide basis for further analysis.

1/18/72
AJM

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

REGENERATION STOCKING SURVEY

Sheet 1 of 1

Type Survey
Post Treatment

District
Medford

Section	Township T34S	Range R3E	Meridian Will.	Acres 1	[redacted] SITE CLASS III

Name of examiner D. J. Miller	Atlas Key No.	Plot Radius Variable	Date examined January 18, 1972

SURVEY [redacted] POINT No. (a)	1-3 yrs [redacted] 8.5' rad. (b)	4-9 yrs [redacted] 10' rad. (c)	10 + Yrs. [redacted] 12' rad. (d)	Site [redacted] Condition (e)	REMARKS
1					
2			1 PP		
3					
4	1 PP		1 PP		
5	1 PP				
6					
7			1 PP		
8			2 DF		1 extra 10+ DF
9					
10					
11					
12			1 PP		
13			1 PP		
14	1 DF		1 DF		
15			1 PP		
16	1 PP				
17	1 PP				
18	1 PP				
19			1 PP		
20	1 DF				
21	1 PP		1 PP		
	8		10		
$\frac{8}{21}$ =	38%		$\frac{10}{12}$ = 48%		
Stocked Pts / Total Pts	=	15/21	= .72 =	72 %	Stocking
		Or			
	38%				
+	48%				
	86 %				
−	14 %	— Plots #	4, 14, & 21	(multiple	tallied plots)
	72%	Stocking			

Form 5700–3 (August 1970) (Instructions on reverse)

Reforestation Record Keeping

The subject of reforestation record keeping is a perennial problem for us all. With one table we have attempted to do three separate jobs. In addition, none of us enjoys maintaining a sophisticated record keeping system just to be able to answer questions from Washington. We have sought a system which will require little daily or periodic upkeep and will tell us at a glance what we need to know. But the complexity of accounting for inventory records maintenance, success and failure records, and data for planning workloads does not lend itself to simple one line entry bookkeeping.

The easiest of the three records to maintain is the inventory. A simple atlas entry form for accretion or depletion will handle this record. I would su-gest that a form similar to a Journal Voucher used in accounting or bookkeeping will be most satisfactory for this purpose. Such a form would have a debit or depletion column and a credit or accretion column with space to note the way the action was determined.

Success and failure records can be incorporated into the daily or periodic work accomplishment tables and reflect the satisfactory accomplishment of reforestation efforts, or the failure of same.

The system of records we have been maintaining in the South Area of the Coos Bay District is designed to do two things -- first, they tell us what we must do each year in the following categories:

1. Areas needing treatment
2. Areas needing first surveys and second surveys
3. Areas needing retreatment.

Second, it accounts for every acre denuded or found to be nonstocked. In addition to the reforestation record, we are attempting to maintain a record of areas needing some type of pretreatment before reforestation and after-treatment following reforestation.

The system works this way:

1. All areas reported as nonstocked, for whatever reason, are logged into a book (looseleaf binder) together with a map of the area. This book is simply a book which shows areas needing an initial survey to determine treatment needs. It also prevents the loss of areas through careless action or neglect.

2. Following initial survey the area is classified as to the type of treatment needed including:

    a) brush eradication
    b) hand planting

c) Atrazine spray (grass control)
d) animal damage control
e) slash or debris disposal.

These are just some of the treatments used. When classified, the area is placed in the "need of treatment" book (also looseleaf) and logged in under the appropriate treatment. From these lists we develop our annual work plan and contracting requirements.

3. When an area is treated by planting or seeding it is transferred to a year book (also looseleaf), logged in with all the appropriate data concerning seed source, etc. From this record we have a yearly knowledge at a glance of what surveys must be accomplished and a handy place for the forester to go for data needed to plan his daily or weekly work schedule.

4. These year books are kept 10 years, then the data discarded or placed on new type maps. The purpose of keeping the books for 10 years goes a step further than to provide updated type mapping. We feel that at years 5 and 10 the area should be checked to determine future treatment needs including brush control and precommercial thinning, which information will be transferred to the "need of treatment" book for action.

All books are designed with, first, a "Log" or table showing what is in the book and, second, a map of the area and a comment sheet (usually the back of the map). The map is transferred from book to book until we are satisfied that the area is fully stocked and out of competitive danger.

The entire system is keyed to the existing Table VII and Atlas overlays. This, however, is causing us some concern since the Atlas is at too small a scale to properly depict areas under 20 acres in size. In addition, finding data in the books becomes laborious after the third year. Currently we are attempting to evaluate a key number system which will tell us where to look in the books to find an area. Perhaps the other panel members or the speaker following will have some ideas in this regard.

Simply, this is our system. It is not perfect but it is better than hunting through Table VII every time we want data for our work schedule, or keep up to date on accomplishments.

I know that I have gone over this quickly and that I have left out certain points which you will want clarified. Please do not hesitate to ask questions anytime, nor or following this session. I will do my best to answer them.

/S/

James D. Dougall
Medford District

FOREST DEVELOPMENT WORKSHOP

Salishan Resort, April 24-26, 1972

Topic: Reforestation Record Systems

Moderator: Stewart Avery

I feel that it would be useful to continue the use of the record card in addition to any computerized record system and the management atlas table. The record cards are concise and convenient to use when preparing future projects at the desk.

However, record cards should be modified:

1. It seems that no one uses the punched information spaces on the card. This should be dropped or modified to make it useful.

2. The card format should be redesigned to provide room to include more information -- space is needed to record at least 3 or 4 planting treatments.

3. It has been suggested that we may need a separate card for site treatment (possibly a card of a different color).

4. An adequate portion of the record card should be set aside for remarks:

   ..... Date of lifting of seedlings
   ..... Length of time seedlings are in cold storage
   ..... Seedlings cached or heeled-in on the planting unit, and how long?
   ..... Weather conditions at the time of planting
   ..... Soil moisture conditions
   ..... The overall quality of planting

I feel that the heading on the upper portion of the present card is satisfactory. I also feel that the columns for seed source, nursery, size of stock, etc. are adequate.

In the past too much important information has left an area when the rehab man was transferred to another job or out of the District.

Panel Topic: Reforestation Record System

"computerized approach to a reforestation information system --"

OBJECTIVES: The two main objectives of the existing system are:

1. to calculate and summarize the current year's development activities compiled in the form of the Annual Status Report

2. the second objective is to provide a means to compare the status of development activities of the current year with activities of a previous year

METHODS: The existing method used to obtain these objectives includes the collection of data and transcribing the data to McBee Keysort cards (Forest Rehabilitation Record). In order to extract information from these cards, the user determines the sorting items and extracts the required cards by inserting a pin through holes in the cards corresponding to the pre-determined sort items. Once the required cards are extracted from the file, the user reads the necessary information from the cards, performs his calculations and summaries, and transcribes his results to the Annual Status Report.

At one time this method was effective and certainly more efficient than extracting recorded information from long lists. But technology has provided us with computers to store and retrieve vast amounts of information.

A computerized method to obtain these objective would be simply to transform the data from the Keysort cards to data processing cards, then program a sequence of instructions for a computer; to sort, extract, calculate and summarize, and print the required information in the form of the Annual Status Report.

It is desirable to identify all objectives of a system before or as the system is designed. This would insure identifying the necessary data to be collected to achieve the objectives. However, foresight is not always clear so adjustments and modifications of systems are sometimes necessary. Updating a computerized information system to include additional data or to correct invalid information which may have resulted from errors or out-of-date material, can be done through an UPDATE phase of the system to provide an information file that is up-to-date and edited.

With this edited, updated file, the computer can then be instructed to process the information according to the specific objectives of the system and requirements of the user.

PROCEDURES: An example of an existing computer information is the OPERATIONS INVENTORY

Information is collected in the field and recorded on field records then repunched on data processing cards and are printed for a visual edit of the information.

An example of a few computations from the O.I. is as follows:

> for each plot, the computer calculates and sums the basal areas of only live conifer trees that have a diameter greater than 7 inches. If the plot is located in TMA 20, the computer is instructed to use a green volume to basal area ratio of 290, then it calculates plot volume (GVB × SUM BA) and converts Plot volume to volume/acre by using the prism factor or Plot size. The information is stored until all calculations for the plot are accomplished then is printed and the computer is ready to begin processing the next plot.

The operations inventory information system also creates a new information file for the MAP MODEL SYSTEM that will be described in another session.

Individual user needs, other than the objectives of the system, are sometimes overlooked. The operations inventory uses yet

yet another program called a report generator which is entirely flexible for individual user requirements. This program will read the information file, sort, stratify, exclude or include information, summarize, subtotal, total and finally print a report containing only the information the user solicited and in the form designated by the user.

An example from the operations inventory might be to instruct the computer to:

Print a list of plot locations, their corresponding area, age site index and volume/acre for plots in TMA 20 that meet all the following conditions:

stand age between 30 and 60 years
site index greater than or equal to 110
and volume/acre greater than 3,000 bd. ft.

Such a list would be solicited for a particular need such as analysis or to assist in a management decision for a specific problem by condensing only relevant material.

BENEFITS: Some of the benefits of a computerized reforestation information are:

1. maintenance - an information file can be maintained for valid up-to-date information quickly, efficiently, and safe from loss or destruction.

2. Provide the Annual Status Report within minutes upon request.

3. Comparison files - a file could be created and maintained each year for a comparison of plots or surveys over time (e.g.) to measure the success of a particular development activity.

4. Individual user requirements can be obtained at any time in the form of a specified printed report that could be used for management or analysis

An example might be this - in order to identify certain problem areas -

Have the computer list the plot locations and the corresponding percent of area, adequately stocked for both the 1st and 3rd year surveys. Include only plots in TMA 10 that meet the following conditions ----

Areas planted with 2/0 Doug-fir stocking in 1968 and areas on SITE CLASS III.

5. Another benefit is that the information from this system can be used in other systems such as MAP MODEL

The list of benefits could go on -- I have omitted the obvious ones of speed, accuracy and capability to store and retrieve enormous amounts of information.

I hope this has given you a general idea of what a computerized information system could do through the example of what a system is now doing.

REFORESTATION RECORD SYSTEMS

Gordon C. Orloff
Eugene District

Our present system is complicated, repetitious, and inadequate. We have our Table VII atlas entry, Atlas overlay, which is too small of a scale, rehab cards, and various other separate personnel records.

Some of our areas have as many as four atlas entries which equals four key numbers and cards. This is impossible to use for information needed in a hurry and is very time consuming to complete reports.

My personal feeling is that we need to keep track of our land as if it was our own. We are blessed with enough manpower and money to begin the job of finding out what exactly is on our ownership and where it is.

We have begun what we call our forest development inventory. We are looking at every parcel of ownership we own with forest development in mind.

I have devised a work sheet to use in the field which I will now explain. We take the following list of materials with us.

1. All rehab cards for the section.
2. Photos
3. Stereoscope
4. 1" - 1000' map of section
5. Work Sheet
6. Operations inventory information
7. Tatum
8. Regeneration Survey Form

9. Increment Borer.

10. Dot Grid.

Once we have this information the real problem of record keeping begins. I have tried to devise a system but I am still not very pleased with it. At present we have files set up by township, range, and section. Each section has an envelope with the map, worksheet, and rehab cards in it. I have attempted to come up with an easy to use summary sheet of each township and range. The present sheet has everything on that is needed but is not large enough to enter everything and is not easy to use. I feel it is time to put forest development records on a computer.

T.______ R.______ SEC.______

Date__________

Examiner__________

SITE INFO.				STOCKED					NONSTOCKED							NOT FEASIBLE TO TREAT		PRECOMMERCIAL THINNING				REMARKS
Key Number	Site Class	Soil Series	Access	Acres	Birth Date	Grass Release	Brush Release	Species	Acres	Birth Date	Retreat (Stock Size)	Natural	Grass Control	Brush Control	Species	Acres	Reason	Acres	Check	Thin	Year.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

1. Rehab card no. or assigned alphabetical order if no rehab no. is available.
2. From soil series or inventory data.
3. From rehab. card or soils map.
4. Road access--D=dirt, R=rock, N=none
* 5. Areas down to 2 acres in size to be considered.
* 6. Determined from year of germination. (2-0 stock planted in 1965 would have a 1963 birth date). If area seeded in naturally, assume that the heaviest seed year near the approximate stand age is the average birth date of the stand. When increment borer is used to determine age, assume time to reach D.B.H. is 6 years. Stands above precommercial saw thinning (20-25 years old) need not be inventoried.
* 7. Trees extablished but not showing satisfactory growth because of grass and/or herb competition, or anticipated competition.
* 8. Trees established but not showing satisfactory growth because of brush competition, or anticipated competition.
* 9. Indicate by specie name for brush and perennial or annual for grass specie.
*10. Same as 5; include areas that do not have a second survey. NOTE UNDER REMARKS.
*11. Same as 6.
*12. Needs replanting. Indicate stock size needed. Only areas which will not fill in naturally.
*13. Areas that will fill in naturally. High site, little or no brush or grass competition, available seed source, favorable unit size, favorable aspect, etc.
*14. Needs removal or control of grasses and/or herbs before regeneration can be established satisfactorily.
*15. Needs removal or control of brush before regeneration can be established satisfactorily.
*16. Same as 9.
7. Same as 5.
18. Swamp, rock, power line, right-of-way, grassland with no capability to grow trees.
*19. Same as 5.
*20. Areas to be thinned in future but should be checked before thinning. Also areas possibly needing thinning in future.
*21. Areas that definitely will need thinning.
*22. Indicate to nearest 5 years when action should be taken.
*23. Environmental considerations (stream, swamp, civilization, grazing, etc.) for spraying projects. Crown relations of conifers with brush for spraying, animal damage. Any other factors influencing rehab. or thinning.

*To be completed in field.

TABLE VII
REFORESTATION

UNITED STATES
DEPARTMENT OF THE INTERIOR

Management Classes
Intensive Mgm't — I.M
Modified Mgm't — M
Restricted —— R
Protected —— P

________ STATE ________ DISTRICT
________ MASTER UNIT

FISCAL YEAR ________

Stocking Standards	
Site Class	Tree/Acres
I-II	350
III	300
IV	200
V	150

Animal Damage	
Deer —— D	Light —— L
Rabbit —— R	Moderate — M
Mtn. Beaver — B	Severe —— S
Domestic animals — G	

Management Class	LOCATION			CLASSIFICATION						INITIAL SURVEY					TREATMENT									SURVEYS							REMARKS
	T.	R.	Sec.	Timber Sale			Ac.	Ac.	Ac.		Stocking		Ac.	Ac.	Ac.	Ac.	Seed Lot No.	Planted			Seeded		Nat'l	FY				FY			
											Ac.	Ac.		R/W				Ac.	M.		Ac.		Ac.	1st Survey				2nd Survey			
																								Ac.	Ac.	Ac.		Ac.	Ac.		
				Contract No.	Date Sold	Date Denuded	Harvested	Burned	Other	Site Class	Stocked	Non-stocked	Not feasible to treat		Initial	Retreatment			No. of trees	Type of stock		Lbs. of seed		Stocked	Hold	Understocked	Animal Damage	Adequate	Inadequate	Animal Damage	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

REFORESTATION RECORD SYSTEM

For years, it has been recognized that our present Atlas Table VII needed revision to more adequately record reforestation data. This proposed format incorporates changes to accommodate our new survey system and provide a functional method of summarization. In order to promote simplicity and continuity, reforestation data appears to be best recorded as a separate activity, hence the proposed revision is designed to record only reforestation activities.

The new table was developed to satisfy the following functions:

- Maintain a current record of the classification and status of reforestation acreage.
- Provide a means by which reforestation acreages could be summarized for inclusion in the Reforestation Status and Annual Survey report (5700-1.)
- Establish a base from which to develop annual work plans for treatment and surveys.

The following is a step-by-step explanation of each column entry. Note that the table is designed to record data by fiscal year, thus requiring a new table for each operating year. See attached example of table format--Figure I.

Management Class

1. Enter appropriate class symbol. Note, it will be necessary to make separate entries when more than one management class is involved in a treatment area. (Management Class symbols are shown on top margin of sheet.)

Location

2,3,4 Enter township, range and section number.

Classification

5. Timber Sale
Contract No. - Number of the timber sale becomes the reforestation reference number. By adding a dash and the last digit of the fiscal year, map references can be made to the particular line entry by fiscal year.

6. Date Sold - enter month and year of sale (timber sale date.)

7. Date Denuded - enter month and year of final cutting from final cutting reports.

8. Acres Harvested - Enter total acres denuded by timber sale.

9. Acres Burned - Enter only acres denuded by catastrophic loss to wild fire.

10. Acres Other - Enter all other acres denuded by causes not covered under 8 and 9.

Initial Survey

11. Site Class - Enter appropriate site class; class may be averaged if area is dissimilar or separate line entries may be made to identify specific acres by site class.

Stocking

12. Stocked - enter acreage of area with adequate residual stocking.

13. Non-Stocked - enter acreage of area which is inadequately stocked.

14. Not Feasible to Treat - enter acreage of area classed as non-commercial forest lands which could not feasibly be treated to an adequate stocking level.

15. R/W - acreage of clearcut right-of-way which is harvested outside the normal setting boundaries which would not be treated. This classification permits accountability of total area harvested by timber sales.

Treatment

16. Initial - acreage of area treated for the first (initial) time.

17. Retreatment - acreage of any area receiving more than one treatment.

18. Seed Lot No. - enter standard coded seed lot number, ie, 202-061-1.5-66; species; seed zone; elevation; year of seed collection.

Planted

19. Acres planted.
20. Number of trees planted (M).
21. Type of stock, ie; age, bullet, plug.

Seeded

22. Acres seeded.
23. Pounds of seed used.

Natural

24. Acres left for reforestation by natural restocking.

Surveys

Surveys are noted by a Fiscal Year entry for identifying the year the post-treatment survey is due to be taken. Example: Areas treated in F.Y. '71 would have a first survey in F.Y. '72 and a second survey in F.Y. '74. However, survey dates are considered to be best defined by districts to accommodate their own local condition for determining success of treatments.

1st Survey

25. Stocked - acres classed as stocked by minimum number of trees required by site quality and over 60% of land area. (Note stocking standards in upper margin)

26. Hold - acres classed as inadequate but may become adequately stocked by second survey due to surrounding seed source or other means.

27. Understocked - acres requiring further treatment to obtain adequate stocking level.

28. Animal Damage - column for recording damage to stock due to animals. This permits identifying possible problem areas and the degree of damage. Entry is coded using Animal Damage Legend, ie, heavy deer browse would be shown as D/S.

2nd Survey

29,30,31 Entries are similar to 25, 26 & 28 above.

32. Remarks - a provision for flagging specific rehab problems or modifications to line entry may be used as needed.

Summarization:

Table summarization is accomplished at the closing of the year by simply adding all acreages within the columns and carrying the totals to the appropriate entries on the annual reports and Table III, Annual Inventory.

Project Mapping:

Mapping of the projects is transferred to 1" = 1000' wing maps rather than atlas overlays. This increases the accuracy of mapping at the larger scale and reduces duplication. The map can easily be indexed to the atlas line entry using the timber sale contract number and the last digit of the fiscal year in which it is entered.

Timber sale contract maps (Exhibit "A") are used as a field file while the area is in a status of treatment and survey. Upon completion of field work, the map is then filed by township and range as a permanent office record of treatment and area. Maps are cross-referenced to atlas line entries by the fiscal year and timber sale contract number. This provides a means of retrieving the total information about a specific area, the prescribed treatment and the stocking results with a pictorial record of the area.

For purposes of organization and clarity, maps are stamped with an information list for each operation. Figure II shows examples of each stamp.

Initial Survey Stamp

Records general silvicultural information needed to establish treatment class and standards.

Treatment Stamp

Records treatment, date and contractor data. Includes entry for subsequent survey results for the specific treatment.

Retreatment Stamp

Records retreatment when necessary and survey results.

See Figure III for example of stamped Exhibit "A" and associated data record.

In use, this sytem generally records the required information for reforestation more adequately than the present system. Other advantages are the utility of information collected and the convenience of summarization and annual reporting. The Salem District feels that this system is an improvement in our efforts to keep accurate and functional reforestation records.

Richard [illegible]

FIGURE I

TABLE VII
REFORESTATION

Management Classes

Intensive Mgm't — I.M
Modified Mgm't — M
Restricted ———— R
Protected ———— P

UNITED STATES
DEPARTMENT OF THE INTERIOR

__________ STATE __________ DISTRICT
__________________ MASTER UNIT

FISCAL YEAR __________

Stocking Standards

Site Class		Tree/Acres
I-II	–	350
III	–	300
IV	–	200
V	–	150

Animal Damage

Deer ———— D	Light ——— L
Rabbit ——— R	Moderate – M
Mtn. Beaver – B	Severe ——— S
Domestic animals – G	

	LOCATION			CLASSIFICATION						INITIAL SURVEY					TREATMENT									SURVEYS							REMARKS
				Timber Sale			Ac.	Ac.	Ac.		Stocking		Ac.	Ac.	Ac.	Ac.	Seed Lot No.	Planted			Seeded		Nat'l	FY				FY			
											Ac.	Ac.		R/W				Ac.	M.		Ac.		Ac.	1st Survey				2nd Survey			
																								Ac.	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.	
Management Class	T.	R.	Sec.	Contract No.	Date Sold	Date Denuded	Harvested	Burned	Other	Site Class	Stocked	Non-stocked	Not feasible to treat		Initial	Retreatment			No. of trees	Type of stock		Lbs. of seed		Stocked	Hold	Understocked	Animal Damage	Adequate	Inadequate	Animal Damage	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

FIGURE II

INITIAL SURVEY STAMP

FISCAL YEAR ________
T.S. CONTR. No. ________
FINAL CUTTING ________
ELEV. RANGE ________
SEED ZONE ________
SOIL SERIES ________
SITE CLASS ________

TREATMENT STAMP

FISCAL YEAR ________
TREATMENT ________
RATE ________
CONTRACTOR ________
CONTR. No. ________
PRICE ________
DATE ________
1st SURVEY ________
2nd SURVEY ________

RETREATMENT STAMP

FISCAL YEAR ________
RETREATMENT ________
RATE ________
CONTRACTOR ________
CONTRACT No. ________
PRICE ________
DATE ________
1st SURVEY ________
2nd SURVEY ________

FORM NO. A1-29A
September 1961

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FIGURE III

Tract No. 71-67

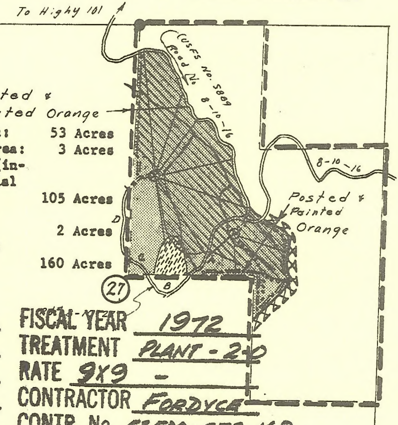
SECTION DIAGRAM

EXHIBIT "A"

Timber Sale Contract MAP CONTRACT No. 36080-TS1-______

T. 8 S. R. 10 W. SEC. 27, Will. MER. Salem DISTRICT

______ DATE ______



Clear Cut Area:	53 Acres
Partial Cut Area:	3 Acres
Reserve Area (including partial cut area):	105 Acres
Previous Sale Area:	2 Acres
Total Contract Area:	160 Acres

FISCAL YEAR 1971
T.S. CONTR. No. TS1-23
FINAL CUTTING 6-71
ELEV. RANGE 1200
SEED ZONE 053
SOIL SERIES BOHANNON
SITE CLASS III

FISCAL YEAR 1972
TREATMENT PLANT - 2-0
RATE 9X9 -
CONTRACTOR FORDYCE
CONTR. No. 53500-CT2-168
PRICE 46.00/M.
DATE 3-72
1st SURVEY 78%
2nd SURVEY ______

SCALE: 1" = 1,000 FT.

LEGEND

▨	Clear Cut Area	═	MAINLINE ROAD
☐	Reserve Area	xxx	PROPOSED SPUR ROADS (optional)
xxx	Approximate area in which trees are marked for cutting in the reserve area	oooooo	YARDING ROADS (CAT OR HIGH LEAD)
		⊗	SPAR TREES (YARDING OR LOADING)
▨	Previous Sale Area	●	CORNERS FOUND
-o-o-	Cat fir trail to be constructed.	— —	BOUNDARY - CONTRACT AREA
-o-	Hand fire trail to be constructed.	═	BOUNDARY - CUTTING AREA
▧	Special Yarding Area		

Paul Kangas

FOREST DEVELOPMENT RECORDS SYSTEM

Future forest development intensity determines the extent of the records system needed.

1. Must be able to follow each acre from planting through final harvest.

2. Must be simple enough for a new rehaber to follow and retrieve information. In the past this was important because rehabers changed with the season. Also, the people in timber groups must be able to retrieve information. The present system is foreign to most timber people. It has been only in the last year that anyone has looked at a rehab card.

    a. We must have a system which could be taken out of the resource group and broken up into the mini-groups. This seems to be the direction we are going with the alleged reorganization. If the system were broken up, it would have to retain its identiry.

    We may want a central system which everyone could use - such as our central filing system.

    b. The present secretive system of record keeping must end. We need a dynamic, easily used, comprehensive record system. We need to be able to retrieve information to make periodic and annual reports.

PRESENT PRACTICES

We use atlases and cards at the present. Cards are filed by township and range, and we do not use the sorting method. On areas where we have 2 - 5 treatments, the cards get cumbersome. An updated card which has provisions for retreatments on the same card and a map would be of benefit.

IN SUMMARY

Be it resolved, that we do need a good record system for a good reforestation program. Assuming that our management will become more intensive in the future, what will we need:

1. System which can follow a unit from harvest to harvest.

2. Simple and easy to use. Could be centralized or de-centralized to fit our organization in whatever direction our organization takes.

3. Must contain information to cover important environmental and historical factors which may influence a stand of trees from seed to harvest.

4. Must have easy way of retrieving information needed for reports of accomplishment throughout the year.

5. Must be able to copy essential data and map for use in the field.

6. Should be able to quickly tie rehab record to aerial photos.

ROSEBURG FOREST DEVELOPMENT

FLOW CHART

Harvest - Initial Survey - Site Preparation - Treatment

1st yr. survey - 2nd yr. survey - 3rd yr. survey - 4th yr. survey -

5th yr. survey - other survey

Future pre-commercial thinning

Other treatment

No treatment

A BLM APPLICATION OF THE MAP/MODEL SYSTEM [1]

Introduction

The Oregon State Office of the Bureau of Land Management is making a trial application of a geographically oriented information system called Map/Model.[2] The general purpose of the trial is to explore the characteristics of the Map/Model system and test some of its potential contributions to BLM resource management.

Need for Automation of the Information System

The term "information system" is used to describe the collective processes of organizing data, entering it on into storage, and the subsequent retrieval of information in useful forms. As used here "information system" does not include the original data collection phase. An information system may be as complex as a man's mind, which is subject to forgetting detail over time. When the data is complicated and no loss of detail is permitted, an information system may use mechanical aids for thorough and systematic data handling.

The Bureau planning system is aimed at making better decisions about the management of available natural resources and the money and manpower resources associated with management alternatives. Planning and decision making are requiring increasing amounts of data, more information processing, and more complex analysis. The need for

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[1] An interim report on the Map/Model Test, May 26, 1972, David H. Nelson

[2] See selected reference list on page 19.

improved geographic information systems is increasing as the kinds of data relevant in planning increases. An automated information system would complement the planning system and promote its objectives by integrating and fully utilizing available recorded data.

Also the need for systematic and coordinated use of mapped information increases as management objectives become more complex. For instance, the emphasis in forest land management is shifting from an early timber orientation and now explicitly includes multiple output objectives, ranging from wildlife habitat improvement to visitor days by recreationists, as well as timber products. Resource output goals and utilization planning are based in part on the productive capability of the land and are ultimately achieved through use of mapped information to designate parts of a whole area for production of different output mixes. The mapped data necessary for resource planning is increasing in both quantity and complexity and this trend will continue as land use competition increases.

As stated at the outset the general purpose of this trial is to explore the applicability of the Map/Model system to satisfy data handling needs associated with the Bureau planning system in the context just described. The more specific and immediate need is to examine Map/Model as an aid in operating the Bureau's allowable cut plan in western Oregon. The allowable cut plan specifies acreage objectives for different intensive timber treatment practices (Appendix 1, page 2) 2/. At the same time the planning process is

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2/ Relevant sample material included the cited appendix is cited this way throughout the report.

identifying and imposing more limitations on timber management practices in specific mapped areas of BLM lands (planning system, management framework plan; timber management activity plan, the allowable cut plan - intensive production forestry; and new legislation, National Environmental Policy Act). The Map/Model system can be used to systematically locate all of the areas available for the treatments specified by the allowable cut plan, and do it utilizing limiting land use and other criteria identified by the planning system. Performing the specified timber management treatments is important because the increased timber growth which results makes the declared allowable cut possible. The specified treatments account for 233 million board feet (Scribner Dec. C), approximately 20 percent, of the current allowable cut level in western Oregon.

An information system which is geographically referenced is a needed supplement and sequel to the BLM planning system and for information handling efficiently at operation levels. Such an information system should:

1) translate geographic (map) data into a form suitable for computer processing

2) accommodate numerical analysis of data at a mapped location (area or line) and summations of numerical data at different locations. For example acreage may be calculated for an area with the coordinates of points on its boundary, timber volume on the area may be obtained by using volume per acre and acres in the area, and finally volume for all areas in the sixty year age class may be determined.

3) accomodate spatial (relative location) analysis of mapped data by using numerically defined models of conditions which vary by geographic location. For example, the system can be used to locate thinnable 60 year old timber on soils with a low erosion susceptability.

4) increase the speed and efficiency in processing data currently handled manually and permit more use of data which is not fully used now because of the inefficient nature of manual methods.

Automated information systems which are geographically referenced were reviewed in 1970. The Map/Model system was selected for a trial application as the system most nearly meeting our specific requirements.

The Map Model System

The Map/Model system is used to store and process different kinds of mapped data sets called models, individually or in combinations. A model is simply a representation of a real thing. The model may be a map of land parcels, a map of timber types or any other kind of map and may include data associated with the mapped units. Models in the system, like maps, are composed of points, or lines, or areas. Mapped lines and areas are simplified in the models and represented by points connected by straight lines. Each point in a model is identified by and stored as a pair of coordinates, x and y. Definition of the models separates the kinds of data (timber, land status, roads, etc.) to keep the models as simple as possible and to avoid redundant or conflicting information for a given location. When

the problem being examined by a user of the system requires data from different models, the relevant models are overlayed by the computer and the required data is retrieved according to the users instructions.

In addition to location data the models contain two kinds of information, file identification data for the mapped units, and data on characteristics relating to the mapped units. The characteristics of the mapped units to be recognized in the models are called variables and may include any number or amount of data, although there are practical cost limitations. Any characteristic may be recognized as a variable, but those which change from map unit to map unit are most commonly used in this test. For example timber stand age is recognized as a variable in the in-place timber inventory model. All mapped units are in Oregon so this characteristic is not a recognized variable. The variables in the trial application models are itemized in Appendix 2.

Data for each model is stored in blocks called files. Computer processing of data is faster when data is processed in blocks of a size suited to the computer being used. The geographic area covered by a file is decreased as the density of map detail in a model increases so that the data in the file approximates the efficient size for processing. During data retrieval procedures data for the files is aggregated as necessary to fit the needs of a user.

The major functions of the Map/Model system include:

1. Accept location, characteristic and coordinate data for storage and processing as map models representing areas, or lines, or points. The maps to be stored can be of any scale and any kind of map projection utilizing an x-y coordinate system. The mapped units are defined by coordinate paris which are derived with a digitizer. Digitizing is the process of assigning x (east) and y (north) coordinates to each angle point of a line or polygon and the control points. For valid comparison overlays, the different maps and resulting models should have a common coordinate base, and represent the different kinds of geographic data which are at the same physical locations with coordinate pairs which are equal. Appendix 3 includes input map examples.

2. Edit mapped areas which are entered into the system for complete and mutually exclusive area coverage.

3. Convert digitizer generated coordinates for map points to coordinates measured in feet on the universal grid. This process permits use of source maps of different scales and provides a common base for map comparisons. The system also calculates area, line length and other system required dimensions.

4. Retrieve geographic data for matching map data with data associated with the map, file identification data is used for this data merging. The entry of additional data or updating of previously

entered data utilizes the unique location identifying data and new variable values for the characteristic data. Data formats for the variables are automatically maintained as processing procedes through the different functions of the system from input to retrieval and display of the output data.

5. Compare and combine pairs of models to create a new combination model of the overlayed maps which contains all the data in each of the original models. This automated model overlay creates a new model with new areas so that the characteristics of each delineated area remain uniform. This comparison function is analagous to physically overlaying different maps but has the additional value of merging all the associated data and creating a new model which can be plotted or processed in combination.

6. Sort and/or summarize data in the map models by data file or according to instructions specified by user (Appendix 4).

7. Display data retrieved from storage in printed tabulations or as plotted maps. All data in a model may be printed and/or plotted. The display may also be limited to selective tabulations (Appendix 4, page 2) and/or pen and ink plots of only the areas which satisfy the user specified criteria (Appendix 5). The scale of the plotted maps may be specified by the user.

These functions are preformed by separate program components so that the user can review results of each step and take the desired option in the subsequent step.

The Map/Model system is general purpose and flexible. Models may be added or deleted as necessary since each model is independently stored and maintained. Map/Model is user oriented in that the system is flexible, it can be use to meet differing needs and utilizes an easily learned language for retrieving information. Sophisticated reprogramming is not required for most applications and this facilitates timely use of needed information.

Review of the Test Steps

This trial application of the Map/Model system covers the Triangle Lake Timber Management Area of the Eugene District. This 300,000 acre area includes about 70,000 acres of BLM Douglas-fir forest. This area was selected because of the advance state of Management Framework Planning and a completed in-place timber inventory. The size of the area and the realistic detail of map models permit application of the system to operational level problems. The prime target user of the Map/Model system is at the district level. For this reason the objective of this trial is to test operational kinds of applications encountered by district personnel.

A forested area requiring detailed mapping and a large quantity of associated data was selected for this application because of the allowable cut question cited earlier. The Map/Model system can also be applied to areas unlike the trial area, such as eastern Oregon by using models appropriate to the resources, conditions, and management problems of the area.

The Bureau of Governmental Research and Service at the University of Oregon in Eugene, one of the developers of Map/Model is under contract to advise the Bureau, and provide program operation services for making the trial application.

The initial step for the user is to define the models required and the variables to be included in each model. Anticipated user problems, uses for the model, and available data limitations are considered during the model formulation process. The models defined during this trial have been limited by kinds of data currently available to minimize manpower requirements. The slope-aspect model is an exception to the existing data rule in that the areas in this model were specifically derived for this test. Variables defined for each model were also limited to those considered necessary and useful in a decision problem (See page 12 and Appendix 2 pages 1-4). Model and variable definition was performed as an interdisciplinary process involving both district and state office personnel.

The preparation of the location data part of the model (see page 4) began by establishing coordinates for control points at the corner points of the map units to be used as files (Appendix 3, page 1). The control points provide the basis for relating different maps; correct coordinates are important for accurate results from subsequent map overlays. The angle points for lines or areas which represent the map in each model were then marked on separate maps or overlays, 1 inch = 1000 ft. BLM maps were used for most models; the

most common file size in the test is a quarter township, about 6,000 acres. A BLM master unit map (1" = 2 mi.) was used for the management area model; this one file covered about 300,000 acres. A U.S. Geological Survey topographic map (1" = 1 mile) was used as a source map for the soils model. Reduced copies of the base maps and mylar overlays for part of the area are included in Appendix 3. These samples show the four quarter townships containing the Whitaker Creek Management area which is delineated on the basis of a drainage basin.

Data preparation on the characteristics (See page 5) to be recognized as variables for each map model begins with variable selection on the basis of need for the information. The variables to be used are then explicitly defined and the range of numeric values or codes for non-numeric variables set out. For instance, tree diameter, a numeric variable, could range from 00.0 inches to 99.9 inches can be coded as 000 to 999. Tree species, a non-numeric variable could recognize Hemlock, Red Alder, etc., and be coded H, RA, etc. The variable data for each mapped area or line in a model is recorded on data forms by district and state office personnel. The variable data on characteristics is recorded directly onto the premarked maps when a model requires only a few characters of data. In such cases the variable data is punched by the digitizer operator at the same time the coordinate data is entered, for example, the land status model was done this way (Appendix 3, page 3).

The map data (coordinates) was digitized at the Bureau of Governmental Research and Service at the University of Oregon. Digitizing is the process of assigning X (east) and Y (north) coordinates to each angle point of a line or polygon and the control point (See page 4). The test data was digitized using a digitizer machine linked to a card key punch machine.

The models are then formed with an IBM 360 model 50 computer at the university using the digitized map data and the data on the characteristics of the mapped lines or areas. Model building includes the process of converting digitizer coordinates for all the mapped points utilizing the known coordinates of the control points to determine universal grid coordinates for every point to be stored.

Several comparison models are tentatively planned and will be formed to create data combinations needed for specific purposes (See page 12). Model combinations and data retrievals are designed to meet typical operational information needs in close cooperation with district personnel. Data retrieved and displayed under the fiscal year 1972 contract will be completed in June (Appendix 5).

Models and Data in the Trial Application

Only a few of the possible models have been defined and created. The trial includes both line and area models but no point models. The number was limited so that data collection assistance from the Eugene District would not be excessive. Ten of the eleven models listed below have been constructed; update model six has been deleted by combining it with the model three, the other update model.

MODELS DEFINED FOR THE TRIAL APPLICATION

Number	Code	Model Name	Examples of Variables *
1.	LS	Land Status	O&C, P.D., non-Bureau
2.	MA	Management Areas	name of area
3.	OA	Operations Inventory Area	species, stocking, birth date, volume/acre, basal area/acre
4.	UO	Operations Inventory Update	same data as for model 3, but for areas changed due to cutting, planting, etc., over a time period.
5.	VC	Vegetative Cover	species, stocking (more areas delineated than model 3, but type only with no quantative data).
6.	UV	Vegetative Cover Update	changes in cover type (model deleted by combining data in model 4)
7.	RM	BLM Forest Mgt. Restrictions	codes for restriction classes (areas where timber harvesting is either restricted or prohibited due to previously defined constraints such as environmental effect or non-timber use considerations).
8.	SD	Soil Delineations	soil series, slope, mantle stability
9.	RS	Road System	road number, standard, control, use level, cost per mile.
10.	SA	Slope Aspect	slope class, aspect class, elevation
11.	SF	Stream Fishery	stream type, water flow, area of spawning gravel, fish species

* See Appendix 2 for the full set of variables

A detailed description of the variables in each model has been drafted but is not included here due to its length. The data formats used in the test models are included in Appendix 2, a list of the models and variable examples is shown on the preceding page.

Some Uses of the Map Models in the Test

A geographic information system which only stores inventory data, summarizes it and maintains a current inventory by entering new data for changed areas has useful bookkeeping applications. A more significant use of the data and information system is its use in formulating future programs and alternatives, and its contribution to analysis of problems. The Map/Model system provides an information system for handling data and facilitates the analytical applications of the information. The current manual processes of visually comparing maps and combined quantative data comparisons is automated to relieve resource managers of the tedious process of data searching. Map/Model can accomodate detail adequate to the needs of operational planning. It bears repeating at this point that the prime target user of the system is at the district level. Other users could also utilize summaries of the detailed data.

The following questions are examples of feasible data retrievals where information is arithmetically processed, sorted, summarized, integrated, organized, and presented to the user in a more useable form.

What are the characteristics of the areas proposed for withdrawal, or modified harvesting practice, sort and sumarize by species, age, site, location, present timber volume? This is useful in allowable cut and environmental impact analysis.

Find and identify what areas meet a given set of variable specifications for various silvicultural treatments. (Appendix 4)

What are the stream-fishery characteristics of stream on BLM land, and what timber is involved in buffer strips? (Stream characteristics are not separated by ownership by current survey procedures).

What are the soil, slope and vegetation types crossed by an existing (or proposed) road system? This data should be useful in environmental impact analysis and as a guide to estimating road cost relationships.

COMBINATION MODELS TO BE FORMED IN THE TEST

Combination Model Number	INDIVIDUAL MODELS IN COMBINATION										
	1 Land Status LS	2 Mgt. Area MA	3 Oper. Invent Area OA	4 Update Oper Area UO	5 Veg. Cover VC	6 Update Veg. Cover UV	7 Restrict Mgt. RM	8 Soil Delin SD	9 Road Syst. RS	10 Slope Aspect SA	11 Stream Fish SF
1	LS	MA									
2			$OA_{t=1}$ $OA_{t=2}$	UO_{At}							
3	LS	MA	$OA_{t=2}$								
4	LS	MA	$OA_{t=2}$		VC						
5	LS	MA	$OA_{t=2}$				RM				
6	LS	MA	$OA_{t=2}$						RS		
7	LS	MA	$OA_{t=2}$								SF
8	LS	MA					RM				
9	LS	MA					RM	SD			
10	LS	MA					RM	SD		SA	
11	LS	MA					RM	SD	RS	SA	

The complexity of some of these questions requires data from more than one model. The tentatively planned list of the comparison models is shown in the table on the preceding page.

Items for Consideration in Subsequent Reports on the Trial and Future Studies

Several items will be examined prior to completing the present test, others will be explored to some extent but not resolved without additional study.

The current Map/Model trial will help define the criteria relating to the capability requirements of information systems for handling geographically referenced information and the specific capabilities of Map/Model. The organizational level where primary use occurs defines in large measure the details of the system including the needed models, variables, and needs for access to computer stored map data. Use at the district level is considered an essential feature for formulating an operational in-place information system. The present test will analyze the costs, usefullness, and the ability of Map/Model to respond to the information needs of resource managers.

Feasible combinations of the following items should be studied and delineated as alternatives in the use of geographically referenced information systems.

1. Alternative inventory processes for collecting data for entry into an information system should be examined. This involves the identification of the kinds of data suited for and requiring automated data handling. The methods of data collecting range from field plots (such as the current in-place timber inventory, and reforestation stocking surveys), aerial photography and interpretation using photogrammetric procedures and for orthographic photomaps, and in the future remote sensing.

2. Operational problems and organizational options for implementing an automated information system will require study. Examples of such options include: number and size of regions to be covered and serviced by a digitizer - computer - plotter facility, personnel skills required at user locations, and installation scheduling.

3. Review the equipment options for computer and related data processing equipment at a central location, and data input and output equipment at user locations. Needs of the primary users (districts) to put information in and retrieve it, and data retrieval by secondary users (state offices, other public agencies and the public) should be considered in developing these equipment options.

4. Different information analysis needs of resource managers should be assessed and related. Information retrievals for both manual and automated analysis techniques should be served by the information system.

The most comprehensive issue is the Bureau's long term direction regarding automated information systems. Natural resource systems with in-place information are an extension of existing computer applications and involve a change in primary user orientation. An orientation to district use is desirable because of the operational nature of in-place information systems. The use orientation should be designed to satisfy district needs for information retrieval and analysis, and to raise the level of resource management opportunities for Bureau personnel. Introduction of computer access facilities at district offices would also permit sharing of several kinds of computer use on the equipment including processing of timber cruise data, fiscal accounting and timekeeping, engineering calculations and access to the computerized public land records which have been proposed.

Summary

The immediate purpose of the trial application of the Map/Model system is to evaluate its potential for meeting information needs of the Bureau planning system and the timber management activity (allowable cut) plan. The need for an automated information system is presented and the Map/Model system is described as one geographically referenced information system having characteristics needed by resource managers.

General issues of selecting and implementing some automated geographic information system, and the role of such systems in relation to data collection and utilization of information for solving problems,

and organizational change are also touched upon. The Map/Model system is a computer application with significant promise for resource management and it should receive continuing examination by the Bureau.

APPENDICES

1. Allowable Cut Data, a set of management constraints
2. Data Formats for each map model
3. Source Maps and mpas premarked for Map/Models
4. Specifications for five selective retrievals from model combination 5 and part of a sort-summary of the operations inventory model
5. Machine plots of Map/Model data and a sort-summary sheet

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Appendix 1, page 1

Area Constraints Given to Timber Activity
Allowable Cut Computation Program

```
SIUSLAW
                     *** ALLOWABLE CUT COMPUTATIONS ***                                          DATE 01/06/70

                                                                                                 TEST NO.  2
                           SUSTAINED     DATE OF     SYSTEM OF    COMMERCIAL    UNIT OF
STATE        DISTRICT      YIELD AREA    INVENTORY   MANAGEMENT   SPECIES       MEASURE     LOG RULE

OREGON       EUGENE        SIUSLAW       07/01/69    EVENAGE      DF WH WRC     BD. FT.     INT 1/8"

                                                                  ULTIMATE PERCENT OF TOTAL ACREAGE
                                SITE   BASE      REGENERATION  THINNING     FOREST     COMMERCIAL  MORTALITY
UTILIZATION STANDARD            INDEX  ACREAGE   PERIOD-YRS    CYCLE-YRS    GENETICS   THINNING    SALVAGE
FUTURE 7"DBH FIX 5" TOP         150    146900    3             10           54 %       54 %        20 %

                  B R E A K D O W N   O F   A S S U M P T I O N S   B Y   D E C A D E

ASSUMPTIONS BY                        P E R C E N T   O F   T O T A L   A C R E A G E   I N   A G E   C L A S S
CLASS OF TREATMENT               1ST DECADE     2ND DECADE     3RD DECADE     4TH DECADE     5TH DECADE     6TH DECADE +

 I. TEST LEVEL OF HARVEST M FT   1,360,000      1,360,000      1,360,000      1,360,000      1,360,000      1,360,000

 II. FOREST GENETICS
       AGE CLASS 10                                11.9 %         46.2 %         46.2 %         46.2 %         46.2 %
       AGE CLASS 20

III. PRE-COMM. & COMM. THINNING
       AGE CLASS 10                  51.1 %        22.5 %         22.5 %         22.5 %         22.5 %         22.5 %
       AGE CLASS 20                  46.6 %         2.7 %         31.3 %         31.3 %         31.3 %         31.3 %
       AGE CLASS 30                                42.9 %         53.8 %         53.8 %         53.8 %         53.8 %
       AGE CLASS 40                                               46.6 %         53.8 %         53.8 %         53.8 %
       AGE CLASS 50                                                              46.6 %         53.8 %         53.8 %
       AGE CLASS 60                                                                             46.6 %         53.8 %
       AGE CLASS 70                                                                                            46.6 %

 IV. COMMERCIAL THINNING ONLY
       AGE CLASS 30                  14.7 %
       AGE CLASS 40                                59.1 %
       AGE CLASS 50                  27.3 %         3.2 %         61.0 %
       AGE CLASS 60                  28.8 %        99.9 %          3.2 %         61.0 %
       AGE CLASS 70                  28.8 %        54.0 %         99.9 %          3.2 %         61.0 %

  V. MORT. SALV. & FINAL HARVEST  MS(1)   FH(2)      MS             MS             MS             MS             MS
       AGE CLASS  80 - 120        20.1 %   5.0 %   20.1 %         20.1 %         20.1 %         20.1 %         20.1 %
       AGE CLASS 130 - 170        10.9 %  15.0 %   10.9 %         10.9 %
       AGE CLASS 180 - 220        21.9 %  15.0 %   21.9 %
       AGE CLASS 230 - 270        18.4 %  15.0 %   18.4 %
       AGE CLASS 280 - 320        10.4 %  10.0 %
       AGE CLASS 330 - 370                40.0 %
       AGE CLASS 380 - 420
       AGE CLASS 430 - 470
       AGE CLASS 480 +

   (1) REPRESENTS PERCENT OF ACRES IN AGE CLASS TO BE MORTALITY SALVAGED IF AGE CLASS IS PRESENT.
   (2) REPRESENTS PERCENT OF FINAL HARVEST VOLUME CUT BY AGE CLASSS IF AGE CLASS IS PRESENT.
NOTE: THINNING AND MORTALITY SALVAGE VOLUMES INCLUDED AS PART OF DECADE CUT.
```

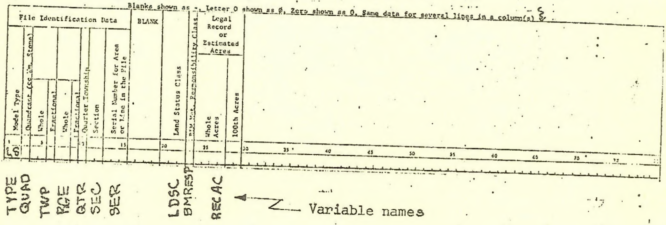
Estimates of available acreages given
to the allowable cut computation program.

Appendix 1, page 2

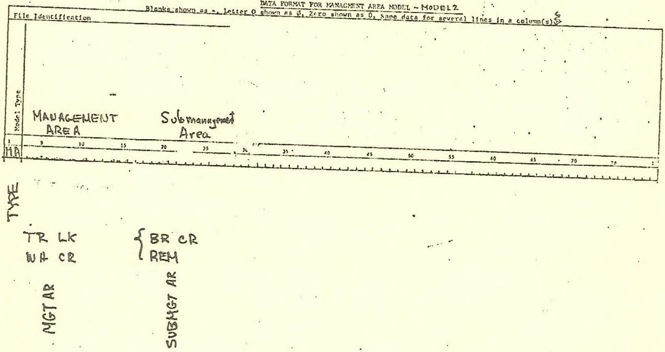
Sample of Volume and Acreage Objectives by Treatment by Age Class and Total (Management Constraints to Be Treated in Place and Done in Specific Period)

```
        SIUSLAW          ALLOWABLE CUT COMPUTATIONS  1.360,000  M   BD. FT.   INT 1/8" DECADE CUT     PAGE   5        DATE 01/06/70
                                                      PROJECTION MFTHOD - EVEN-FLOW HARVEST                              TEST NO.   2
------------------ YEAR  1980 -------------------   ------------------------- PROJECTION  PERIOD  1971 - 1980 -------------------------
                                                         V O L U M E   R E M O V E D   M FT.         A C R E S    H A R V E S T E D
 AGE   TREATMENT               TOTAL VOL     ANNUAL     COMMERCIAL-THINNING  MORTALITY   FINAL      P. COMM.    COMM.   MORTALITY  FINAL
CLASS   CLASS         ACRES      M FT.    GROWTH FT.     VOL 1     VOL 2      SALVAGE   HARVEST   TREATMENT  THINNING  SALVAGE  HARVEST
 N/S  NON-TREATED     15334

 1-5  NON-TREATED      7221

  10  NON-TREATED      5946
  10  PC & C THIN      6213                                                                           6213
      AGE CLS TOT.    12159                                                                           6213

  20  NON-TREATED      9886      76834     4513948
  20  PC & C THIN      8627      99711     8587316                                                    8627
      AGE CLS TOT.    18513     176545    13101264                                                    8627

  30  NON-TREATED     19358     281581     8451703
  30  C THIN 30-70     3336      86296     2768213                                                               3336
      AGE CLS TOT.    22694     367877    11219916                                                               3336

  40  NON-TREATED      6189     116421     2577719

  50  NON-TREATED      1438      32897      570167
  50  C THIN 50-70      540      25164     1017900      6588                                                      540
      AGE CLS TOT.     1978      58061     1568067      6588     By age class in area                             540



 290  NON-TREATED       747      45081      62897-                                63692                                    (1049)
 290  MORT. SALV.       209      11769      114546                         1288                                    209
      AGE CLS TOT.      956      56850       51649                         1288   63692                            209     1049

 300  NON-TREATED      3167     188142      330318-                              509539                                    (8506 ?
 300  MORT. SALV.      1355      75261      719112                         8351                 Totals for         1355
      AGE CLS TOT.     4522     263403      388794                         8351  509539         whole area         1355     8506

      CLEAR CUT AC    22325

  01  DECADE TOTAL   146900    2598487    45301347     28329               57831  1273840        14840      5064     9239    22325

                          INGROWTH        17654500            PARTIAL CUT VOLUME    86160

              TOTAL  ANNUAL  GROWTH       62955847            TOTAL DECADE VOLUME  1360000
```

DATA FORMAT FOR LAND STATUS MODEL - MODEL 1



DATA FORMAT FOR MANAGMENT AREA MODEL - MODEL2



Appendix 2, page 1

Data Format for Models 1 and 2

Data Format for the Operations Area Model (No.3), Update Data of the Operations Area Model (No.4), and the Updated Operations Area Mode

FORM FOR POSTING JUNE 30, 1970 DATA CONDITIONS FOR AREAS WHERE OPERATIONS INVENTORY DATA HAS CHANGED DURING PERIOD BETWEEN
JULY 1, 1969 AND JUNE 30, 1970

* CIRCLED NUMBERS IN THIS LINE ARE KEY TO DESCRIPTION OF DATA, SAME AS THE
FORMAT OF DATA FOR OPERATIONS AREAS MODEL TO BE
DERIVED FROM OPERATIONS INVENTORY DATA PROCESSING PROGRAM

CARD 1 OF 4

Blanks shown as -, Letter O shown as Ø, Zero shown as 0, Same data for several lines in a column (s) ʃ

FILE IDENTIFICATION DATA														DATE OF SURVEY				AREA IN ACRES	OPERABILITY			VEGETATIVE COVER																			
		Township		Range															Tenths of Oper. Area				ENTIRE STAND OR OVERSTORY						UNDERSTORY IF PRESENT						FOREST MANAGEMENT PRACTICES APPLIED; SYMBOL LAST TWO DIGITS OF YEAR OF MOST RECENT TREATMENT						
																											BIRTHDATE YEAR(S)						BIRTHDATE YEAR(S)								
Model Type	Quadrant (cc: Wm. Stone)	Whole	Fractional	Whole	Fractional	Quarter Township	Section	Serial Number of Area or Line in the File	Sample Unit (Oper.Area) Number (Key to field data sheet& map)	Card Sequence Number 1	Timber Management Area	Data Class	Blank	Day	Month	Year	BLANK	FROM SURV. FORM	Tractor	Cable	BLANK	Cover Condition for Area	Dominant Species in Hardwood or Con. Group	Stand Size Class	Sec. Sp. Dom. of Remaining Species	Stocking Class	Even-Age Stand or Start of Age Range	Decade in Age Range	Dominant Species in Hardwood or Con. Group	Stand Size Class	Sec. Sp. Dom. of Remaining Species	Stocking Class	Even-Age Stand or Start of Age Range	Decade in Age Range	Released	Fertilized	Precom. Thinn.	Comm. Thinning	Mortality Salv.	Prep. Cut	Regen Cut
		5				10		15			20			25		30		35			40			45			50		55			60		65		70			75		80
ØA										1																															
* ①									②		③	④		⑤	⑥	⑦		⑧	⑨	⑩		⑪																			
TYPE	QUAD	TWP		RGE		QTR	SEC	SER	UNIT		TMA	DC		DATE				xxx SURV AC	OPT	OPC		CC	CODSP	COSC	COSSP	COST	COBD	COAR	CUDSP	CUSC	CUSSP	CUST	CUBD	CUAR	CPR	CPF	CPPT	CPCT	CPMS	CPPC	CPRC

XXX

CARD 2 of 4

FILE IDENTIFICATION DATA																						IMMATURE STANDS-DATA ON COMMERCIAL SPECIES ONLY (d = diameter breast height)																	
		Township		Range																		VOLUME, SCRIBNER DEC. C.												BASAL AREA/ACRE, SQ.FT.					
																						Whole Stand								Thinn. Portion				Conifers		Hardwoods			
																						Vol./Ac.								Vol/Ac									
Model Type	Quadrant (cc: Wm. Stone)	Whole	Fractional	Whole	Fractional	Quarter Township	Section	Serial Number of Area or Line in the File	Sample Unit (Oper.Area) Number (Key to field data sheet& map)	Card Sequence Number 2	Past Management	BLANK	Site Class	Site Index	BLANK	Vegetative Competition	Forest Type Condition	BLANK	Key Value		Recommended Treatment	Dead		Green		Dead and Green		Total Volume in Oper. Area V/A & Ac		Dead and Green		Total Thinn. Vol. in Oper. Area		d <7"	d ≥ 7" *	d < 7"	d ≥ 7" *	Total Basal Area per Acre	BLANK
																						MBF	10ths	MBF	10ths	MBF	10ths	MBF	10ths	MBF	10ths	MBF	10ths						
1		5				10		15			20			25				30			35			40		45		50		55		60			65	70		75	80
										2																													
* ← SAME AS CARD ONE ABOVE →											⑫		⑬	⑭		⑮	⑯		⑰		⑱	⑲		⑳		㉑		㉒		㉓		㉔		㉕	㉖	㉗	㉘	㉙	
											PM		SC	SI		VC	TC		KVAL		RECT	IVAD		IVAG		IVADG		xxx IVST		ITVA		xxx ITST		IBACL	IBACP	IBAHL	IBAHP	IBAT	

XX

CARD 3 of 4

FILE IDENTIFICATION DATA											IMMATURE STANDS--DATA ON COMMERCIAL SPECIES ONLY																MATURE STANDS COMMERCIAL SPECIES ONLY MERCHANTABLE VOLUME, SCRIBNER DEC. C										
		Township		Range							TREES PER ACRE					AVERAGE DIAMETER											VOLUME PER ACRE										
											Conifers		Hardwoods			Conifers				Hardwoods							Stand Component								TOTAL		
Model Type	Quadrant (cc: Wm. Stone)	Whole	Fractional	Whole	Fractional	Quarter Township	Section	Serial Number of Area or Line in the File	Sample Unit (Oper.Area) Number (Key to field data sheet& map)	Card Sequence Number 3	d < 7"	d ≥ 7"	d < 7"	d ≥ 7"	Total Stems per Acre	d<7"		d > 7"		d<7"		d ≥ 7"		Average dbh All Trees		BLANK	Green (Lo + H. Risk)		Dead		High Risk Green		Mort. Salv. (Dead & H. Risk Green)		Vol/Ac Green + Dead		BLANK
																in.	10ths	in.	10ths	in.	10ths	in.	10ths	in.	10ths		MBF	10ths	MBF	10ths	MBF	10ths	MBF	10ths	MBF	10ths	
1		5				10		15			20	25	30	35	40			45				50			55		60			65			70		75		80
										3																											
* ← SAME AS CARD ONE ABOVE →											㉚	㉛	㉜	㉝	㉞	㉟		㊱		㊲		㊳		㊴			㊵		㊶		㊷		㊸		㊹		
											ITACL	ITACP	ITAHL	ITAHP	ITAT	IDCL		IDCP		IDHL		IDHP		IDAL			MVAG		MVAD		MVAHRG		MVAMS		MVAT		

XX

CARD 4 of 4

FILE IDENTIFICATION DATA											MATURE STANDS				
		Township		Range											
Model Type	Quadrant (cc: Wm. Stone)	Whole	Fractional	Whole	Fractional	Quarter Township	Section	Serial Number of Area or Line in the File	Sample Unit (Oper.Area) Number (Key to field data sheet& map)	Card Sequence Number 4	Total Vol. in Oper. Area T. Vol/Ac x Ac		Mort. Salv. in Oper. Area MS/Ac x Ac		
											MBF	10ths	MBF	10ths	
1		5				10		15			20	25	30		35 40 45 50 55 60 65 70 75 80
										4					
* ← SAME AS CARD ONE ABOVE →											㊺		㊻		
											xxx MVST		xxx MVMST		

XX

xx Variable names in Map Model

xxx Variables deleted in model building due to erroneous acreage data in variable 8, SURV AC, Nos. 8, 22, 24, 45, and 46

Appendix 2, page 2

Data Format for Models 3 and 4

DATA FORMAT FOR VEGETATIVE COVER MODEL - MODEL 5
AND
UPDATE OF VEGETATIVE COVER - MODEL 6 *

Blanks shown as -, Letter O shown as Ø, Zero shown as 0, Same data in several lines of a column(s)

*MODEL 6 DELETED FROM TEST BY COMBINING IT WITH OPERATIONS AREA MODELS

			Column		
FILE IDENTIFICATION DATA		Model Type	1	VC	TYPE
		Quadrant (ec Hm. Stone)			QUAD
	Township	Whole	5		TWP
		Fractional			
	Range	Whole			RGE
		Fractional			
		Quarter Township	10		QTR
		Section			SEC
		Serial Number for Area in Quarter Township	15		SER
BLANK					
VEGETATIVE COVER		Cover-Condition for Area	20		VCC
	Entire Stand or Overstory	Dominant Species in Hwd. or Con. Group			VODSP
		Stand Size Class			VOSC
		Sec Sp. Dom of Rem Sp.	25		VOSSP
		Stocking Class			VOST
	Birthdate Year(s)	Even-Age Stand or Start of Age Range in Uneven Age Stand	30		VOBD
		Decades in Uneven Age Range			VOAR
	Understory if Present	Dominant Species in Hwd. or Con. Group	35		VUDSP
		Stand Size Class			VUSC
		Sec Sp. Dom of Rem Sp.			VUSSP
		Stocking Class			VUST
	Birthdate Year(s)	Evenage Stand or Start of Age Range	40		VUBD
		Decades in Uneven Age Range	45		VUAR
	Forest Management Practices Applied; Symbol Last Two Digits of Year of Most Recent Treatment	Released			VPR
		Fertilized			VPF
		Precom. Thinning	50		VPPT
		Comm. Thinning			VPCT
		Mortality Salvage	55		VPMS
		Prep. Cut			VPPC
		Regen. Cut			VPRC
			60		
			65		
			70		
			75		
			80		

DATA FORMAT FOR BLM FOREST MANAGEMENT RESTRICTION AREAS MODEL - MODEL 7

Blanks shown as —, Letter O shown as Ø shown as 0, same data for several lines in a column

			Column		
FILE IDENTIFICATION DATA		Model Type	1	RM	TYPE
		Quadrant (ec Hm. Stone)			QUAD
	Township	Whole	5		TWP
		Fractional			
	Range	Whole			RGE
		Fractional			
		Quarter Township	10		QTR
		Serial Number for Area in Quarter Township			SER
BLANK			15		
		Restriction Class			FMRCL
			20		
			25		
			30		
			35		
			40		
			45		
			50		
			55		
			60		
			65		
			70		
			75		

DATA FORMAT FOR SOIL DELINEATIONS MODEL - MODEL 8

Blanks shown as ~ , Letter O shown as Ø, Zero shown as 0
Same data for several lines in a column

			Column		
FILE IDENTIFICATION DATA		Model Type	1	SD	TYPE
		Quadrant (ec Hm. Stone)			QUAD
	Township	Whole	5		TWP
		Fractional			
	Range	Whole			RGE
		Fractional			
		Serial Number for Area in Township	10		SER
		Soil File No.			SFN
BLANK			15		
SOIL DELINEATION (Mapping Unit) NAME	Soil Series (up to 3)	Dominant	20		SS1
		Second	25		SS2
		Third			SS3
	Respective Areas of Soil Series Tenths of Entire Area	Dominant	30		RAS1
		Second			RAS2
		Third			RAS3
	Slope Phase	Dominant	35		SLP1
		Second			SLP2
	Respect. Areas of Slope Phase Tenths of Entire Area	Dominant			RASLP1
		Second	40		RASLP2
		Aspect			ASPECT
BLANK					
DATA ASSOCIATED WITH THE FOLLOWING SET: Dominant Soil Series - Dominant Slope Phase-Aspect	Regen. Hazard	Seed	45		RHS
		Bare Soil			RHBR
		[illegible]			RHC.
		[illegible]			EROS
		[illegible]			MANTS
		Hydro Group	50		HYDRO
	Engineering Classification	Unified			ENUN
	ASSHO	Group Class	55		ENAGC
		Group Index			ENAGI
		Size Class	60		SITE
			65		
			70		
			75		

Appendix 2, page 3

Data Formats for Models 5, 7 and 8

FORMAT FOR ROAD SYSTEM DATA MODEL 9.

Blanks shown as —, Letter O shown as Ø, Zero shown as 0, Same data for several lines in a column(s) §

File Identification Data								Other Road No.	Road Number and Segment Designation (For BLM and Other Roads)										Road Control Use and Fee Requirements					4-Way Rd.Std. Classif. for Plcmt.				Road Use & Cost Data Estimate in Amounts Per Mile for All BLM Roads & All Private & Quasiprivate Forest Roads on BLM Land						Remarks
		Township		Range				County State etc.	Twp.			Range					Segment			Commercial Use								Average Annual Use Est. 1000's of Tons/Mile/Year				Per Mile Cost Est.		
																												Road Use by User Groups				Const	Maint	
																												Commercial & Mgmt. Use		Non Comm. Use				
Model Type	Quadrant (ec Wm. Stone)	Whole	Fractional	Whole	Fractional	Quarter Township	Serial No. for Rd. Piece in Quarter Township		Whole Number	Dir. from Baseline	Fractional	Whole Number	Dir. from Meridian	Fractional	Section of Road Orgin. (Usually low elev. end)	Road Sequence Number in Orgin. Section	Letter X- or XX	Number 0Ø or ØØ	Road Control	ROW Rights	Fee Requirements	Non BLM Use Fee Requirements	Public Use	Alignment	Grade	Subgrade	Surface & Use Period	Thr. Haul & Thr. Admin.	Non Thr. Thru Traf. Grav. Land	Recre. Thru Traf. Inter Resid.	Total Use Ton/Mi/Year	Curr Repl Cost Near $1000	Avg Ann. Maint Cost at Est. Near $100	
1		5				10		15	20			25				30		35			40		45					50			60	65		70 75 80
BS																																		
TYPE	QUAD	TWP		RGE		QTR	SER	NBRN	-			ROAD NO				-	RD SEG	-	R CONT	B RITES	FE REQ	NB FEE	PUB US	RS AL	RS GR	RS SG	RS SU	CTBR USE	CNTBR USE	NC USE	TOT USE	CST CM	MTN CM	

DATA FORMAT FOR SLOPE-ASPECT MODEL - MODEL 10

Blanks shown as - , Letter O shown as Ø, Zero shown as 0, Same data for several lines in a column(s) §

FILE IDENTIFICATION DATA								BLANK	AREA DATA				
		Township		Range							Elev. Class (Upper limit of 500 ft.)		
Model Type	Quadrant (or Wm. Stone)	Whole No.	Fractional	Whole No.	Fractional	Quarter Township	Serial Number of Area		Percent Slope Class	Aspect Class	Thousands	Hundred	
1		5				10		15	20		25		30 35 40 45 50 55 60 65 70 75 80
SA													
TYPE	QUAD	TWP		RGE		QTR	SER		PSC	ASP	EL		

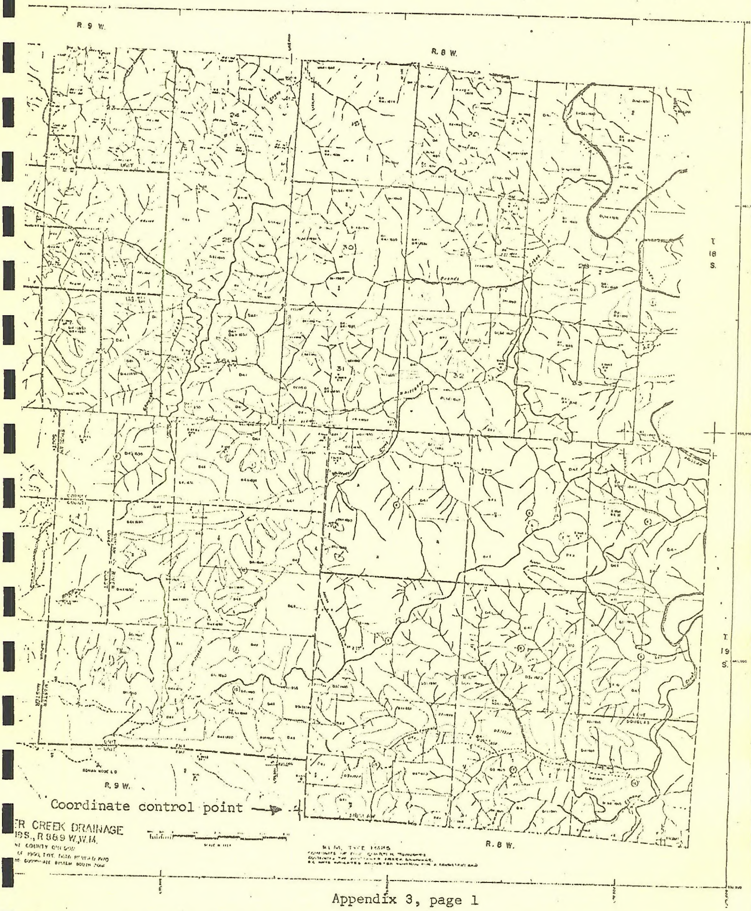
DATA FORMAT FOR STREAM FISHERIES - MODEL 11

Blanks shown as -, Letter O shown as Ø, Zero shown as 0, Same data for several lines in a column(s) §

File Identification Data									BLANK	Identity of Stream Piece							BLANK	Stream Characteristics and Class Symbols											BLANK	Mgmt. Considerations				
		Township		Range							Termini of Stream Piece									Stream Area			Spawning Gravel											
											Downstream		Upstream							Sq.Yd Water Area LoFlo			Total Square Yards											
Model Type	Quadrant (ec Wm. Stone)	Whole	Fractional	Whole	Fractional	Quarter Township	Section	Serial Number for Piece in Quarter Township		Stream Number	Miles	100ths Miles	Miles	100ths Miles	Data Condition Class	Data Year, Survey or Observation		Type	Gradient	Hundreds	Tens	% pool area Class	Hundreds	Tens	% Spawning Area Class	Stream Shade	Fish Utilization	Physical Obstructions		Fishery Index	Limiting Factors	Fish. Hab. Projects	Unusual Features	
1		5				10		15		20		25			30		35			40					45				50		55		60	65 70 75 80
SF																																		
TYPE	QUAD	TWP		RGE		QTR	SEC	SER		STR NO	T DWN		T UP		DCC	DYR		ST	SG	SAWAT		SPPA	SAGR		SPSA	SSHAD	SFUTIL	SPHOB		MC FI	MC LF	MC FHP	MC UF	

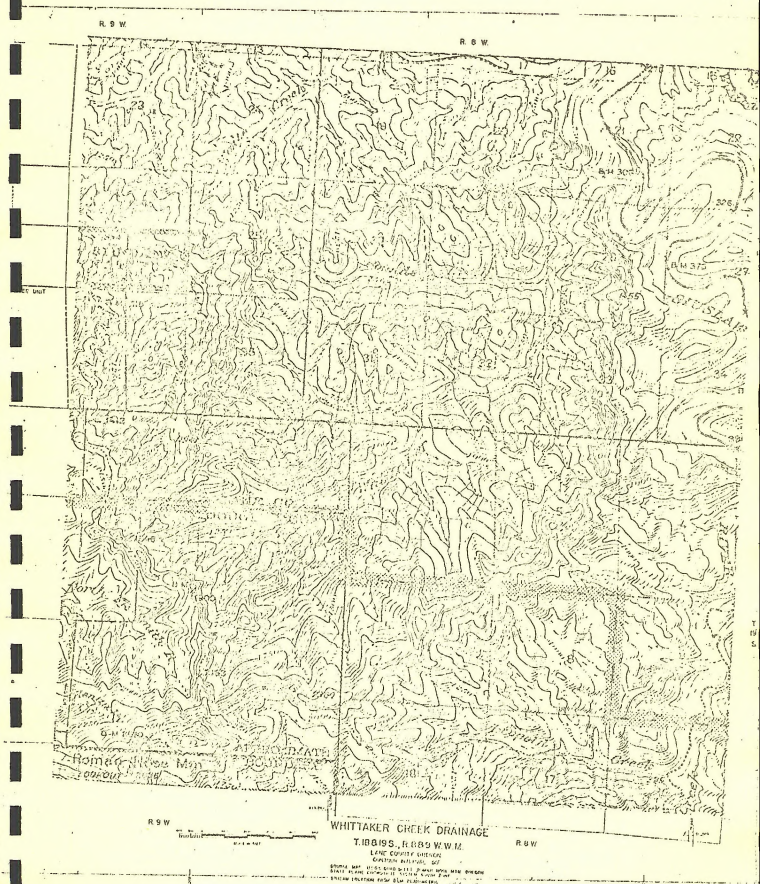
Appendix 2, page 4

Data Formats for Models 9, 10 and 11



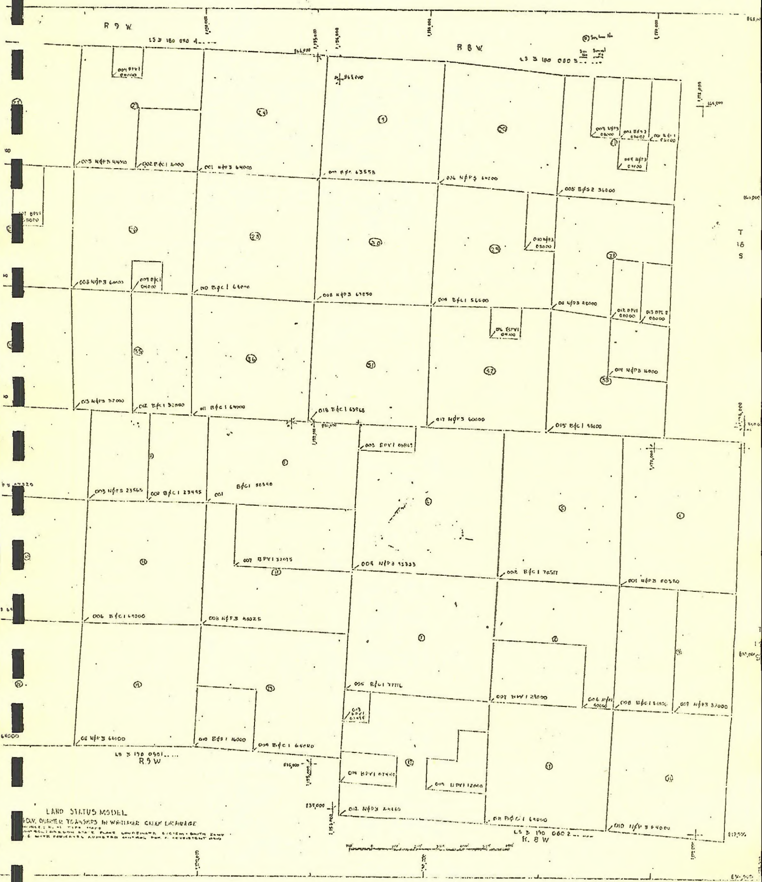
Appendix 3, page 1

Reduced Copy of BLM Forest Type Map Used as Map Base for Most Models



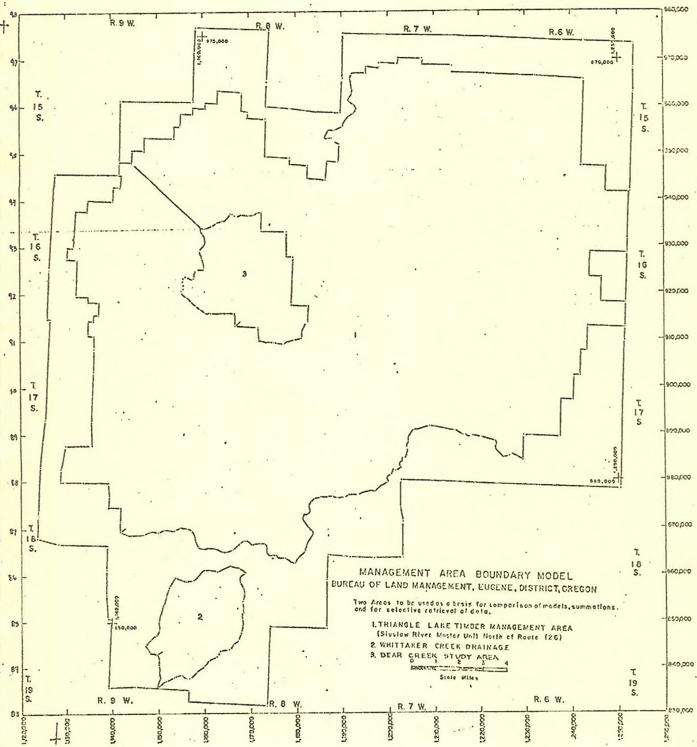
Appendix 3, page 2

Reduced Copy of Topographic Map Used as a Base Map for the Soils and Slope - Aspect Models



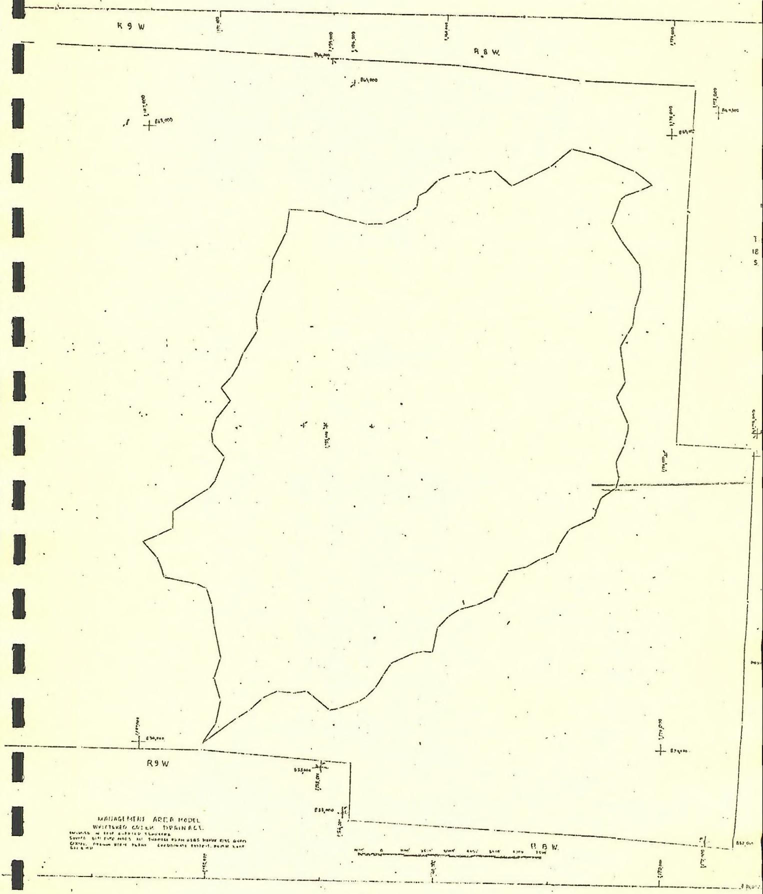
Appendix 3, page 3

Reduced Copy of the Input Map for the Land Status Model and also Showing the Coded Data for Variable Characteristics

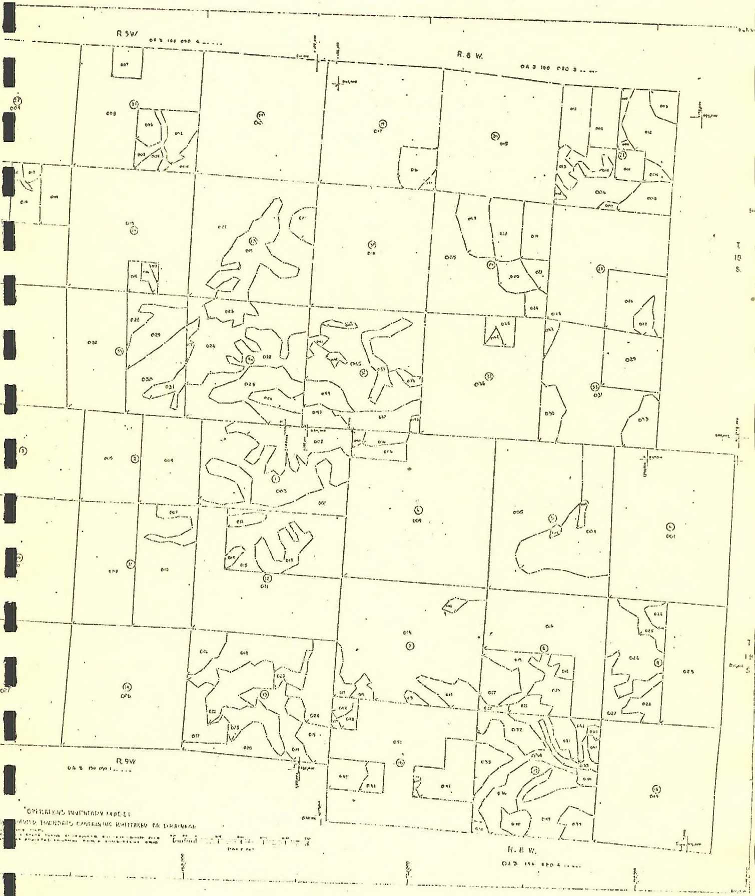


Appendix 3, page 4

Reduced Copy of Input Map for the Management Area Model and the Boundary of the Quarter Townships Used as Files

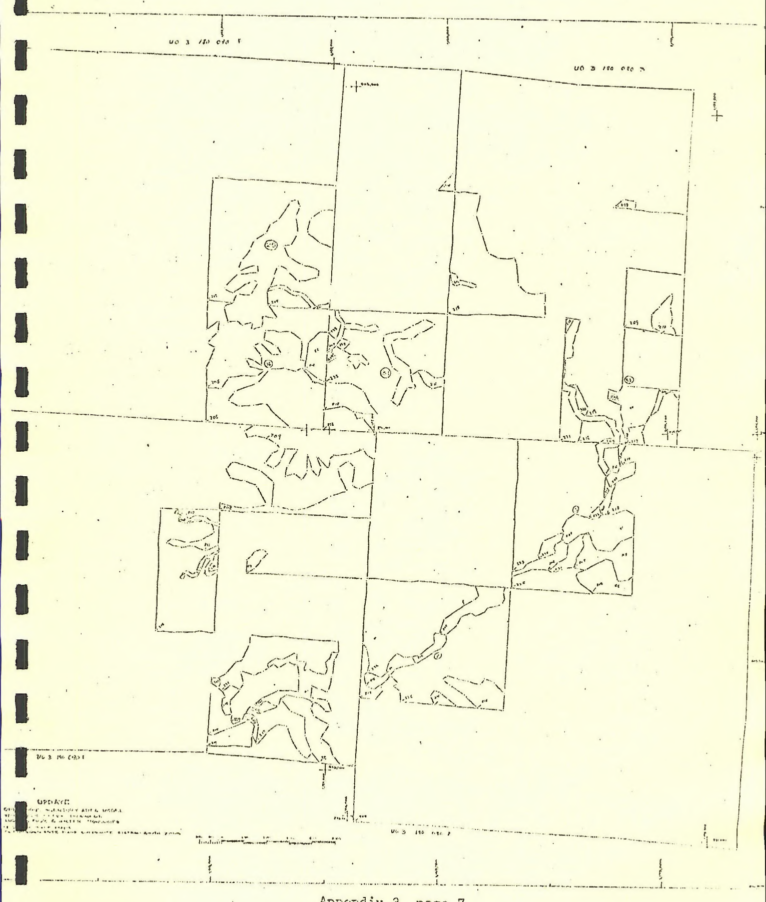


Appendix 3, page 5
Reduced Copy of the Whittaker Creek Management Area



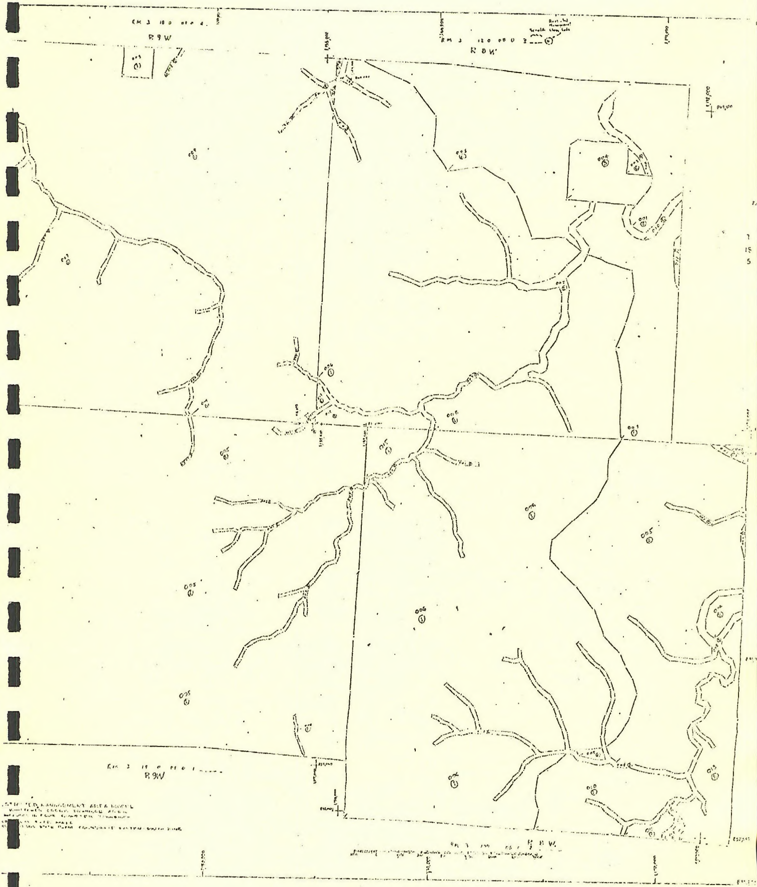
Appendix 3, page 6

Reduced Copy of the Input Map for the Operations Inventory Model



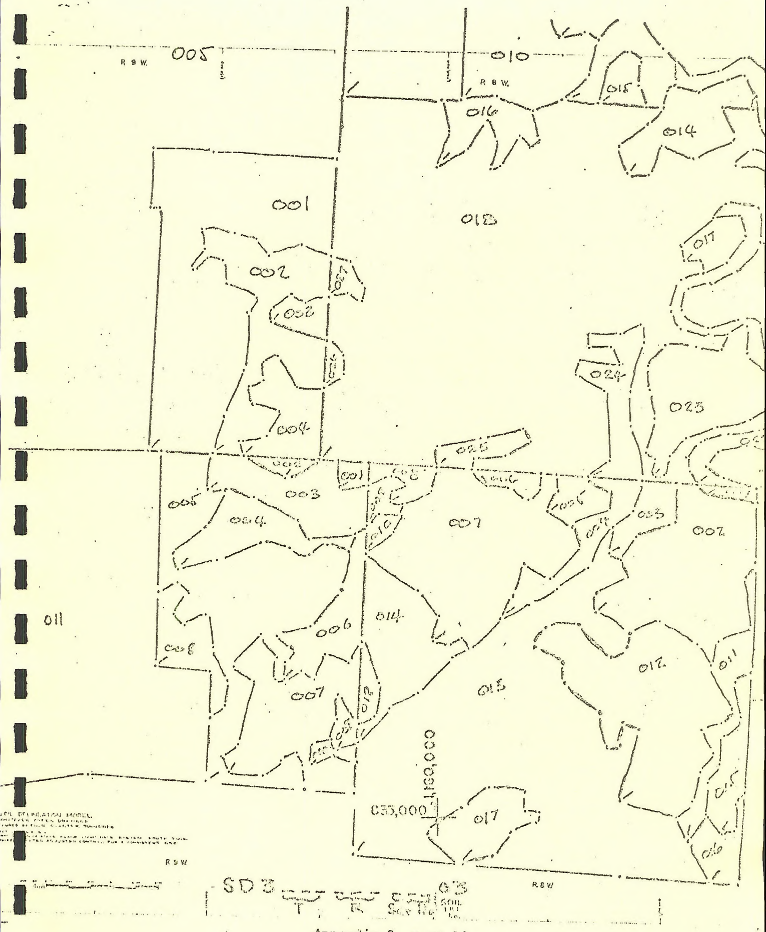
Appendix 3, page 7

Reduced Copy of the Input Map for the Operations Inventory Update Model



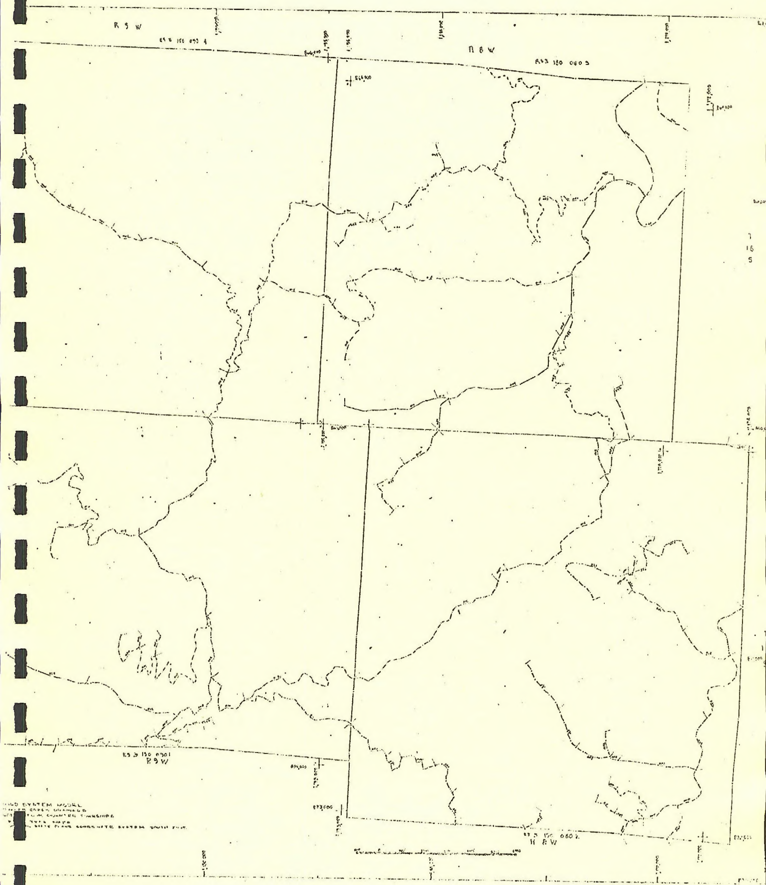
Appendix 3, page 9

Reduced Copy of the Input Map for the BLM Restricted Management Area Model (Degrees of Limitation on Timber Harvesting on BLM Lands)



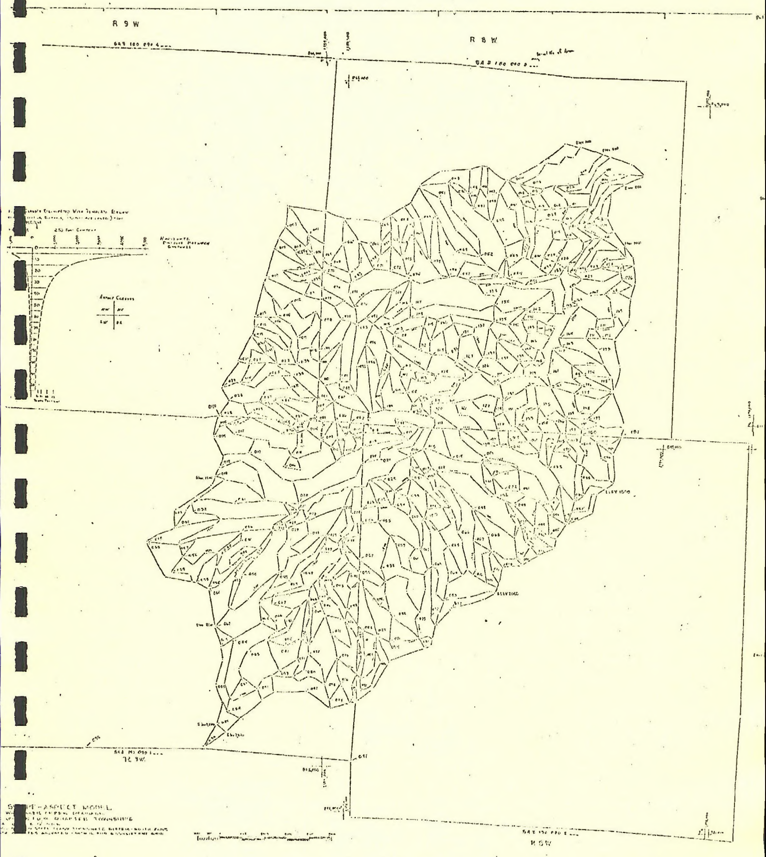
Appendix 3, page 10

Copy of the Input Map for the Soil Delineation Model



Appendix 3, page 11

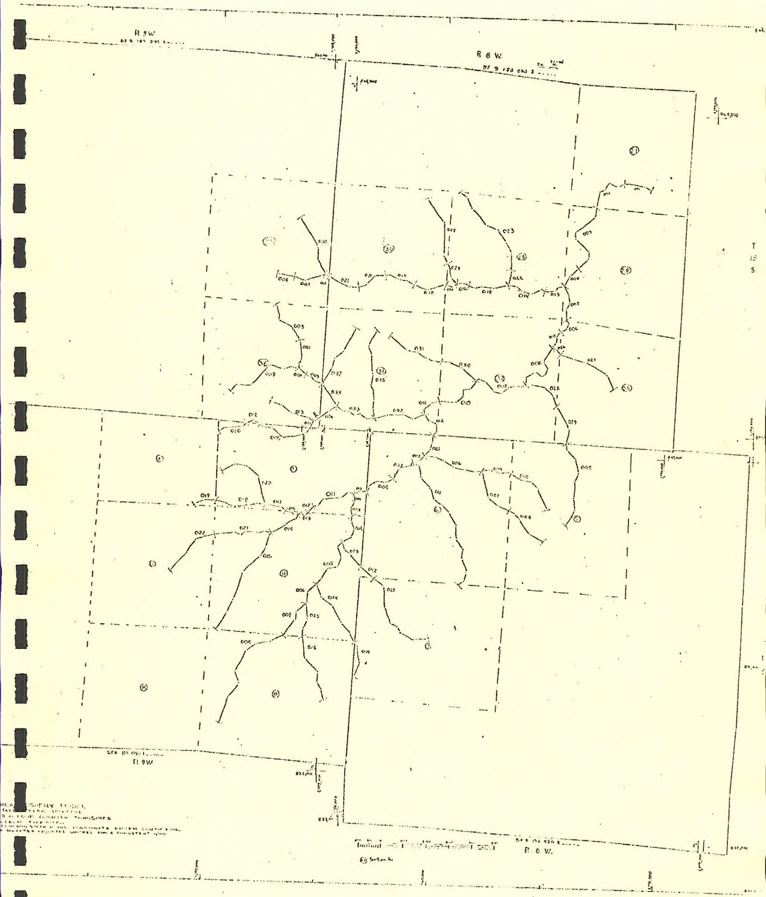
Reduced Copy of the Input Map for the Road System Model



Appendix 3, page 12

Reduced Copy of the Input Map for the Slope-Aspect Model

These areas are developed using a topographic map and the template shown above which is used to delineate slopes.



Appendix 3, page 13

Reduced Copy of the Input Map for the Stream Fishery Model

Model Combination 5

(Land Status × Management Area × Operations Area × Update of Oper Area) × Restricted Mgt. Area
(Model 1 × Model 2 × Model 3 × Model 4) × Model 7
(LS × MA × OA × UO) × RM

FIVE SELECTIVE RETRIEVALS

Specifications* to be used for screening all areas to produce an initial list of candidate tracts for planning action programs.

Variables to be Screened		VALUES OF VARIABLES FOR AN INITIAL SCREENING BY PROGRAM**				
NAME	CODE	Reforestation	Precommercial Thin	Commercial Thin	Most. Salv.	Final Harvest
Acres		and GT 1	and GT 1	and GT 5	and GT 5	and GT 5
Cover-Condition	CC	or EQ.X,XO,NEC,SO				
Overstory Birthdate	COBD	IF EQ 'bb' or GE.1960	IF GE 1937 LE 1962	IF GE 1897 LE 1947	IF LE 1897	IF LE 1897
Understory Birthdate	CUBD		or GE 1937 LE 1962	or GE 1897 LE 1947		
Not previously precommercial thin	CPPT		and EQ 'YY'			
Five Yr. since commercial thin	CPCT			and LT. 67		
Five Yr. since Most. Salv.	CPMS					and LE 67
Past Management	PM	or 'bb' EQ. 2, 5	and NE. 6			
Site Class	SC		and 'b' or GT.5	and 'b' or GT 5		
Type Condition	TC			or EQ.3	or EQ 3	or EQ.3
Key Value	KVAL		and NE. 1, 6, 10	and NE. 1, 6, 10	and NE. 1, 6, 10	and NE. 1, 6, 10
Recommended Treatment	RECT	or 'bb' or EQ.16	or 'YY' or EQ.11	or 'YY' or EQ.5,10,12	or 'YY' EQ 3,4	or 'YY' EQ 1,2,5,6,7,9
Immature Std Merchantable Vol.	ITVL			or GT 2.0		
Immat Std Tot. Basal Area	IBAT			or EQ 'YY' or GT.(80+8(1972-CU[illegible])) or GT.(40+[illegible](1972-CU[illegible]))		
Immat. Std Trees/Ac LT 7"	ITACL	or EQ 'YY' or COBD GE 1960 and ITACL LT 200 or CUBD GE 1960 and ITACL LT 200				
Immat Std Hwd Tr/Ac	{ITAHL + ITAHP}		or 'YY' or GT 200			
Immat Std Tr/Ac Total	ITAT		or GT 600	or GT.(500-5(1972-COBD)) or GT.(500-5(1972-CUBD))		
Mature Std. Vol/Ac Post Sale	MVAPS				or GT. 10	or GT. 10
Total Stocking	{COST + CUST}	or EQ.1	and GT. 1			
Mat. Std Most Salv Vol %	MVOLS/MVAT ×100				or GE.10	or GE 25

*Specifications defined by Eugene District personnel in Triangle Lake Unit and West Lowmore Unit

** GT = greater than, GE greater or equal, LT less than, LE less than or equal to.

Appendix 4, page 1

Draft of a Plan for Five Selective Retrievals from a Combination Model

TRIAL SORT AND MULTIPLE LEVEL SUMMARY OF OPERATIONS
INVENTORY DATA SUMMARY

1. Four level sort by data class, site class, dominant species and birth date.
2. List location data (or other variables as desired) for each survey unit.
3. List values for a specified set of variables; one set for mature volumes and one set for immature variables.
4. Write sum of variables for each level of the sort.

Summary Subtotals

Calculation by Area

SORT STRATA | LOCATION | MATURE VOLUME VARIABLES ONLY | AREA

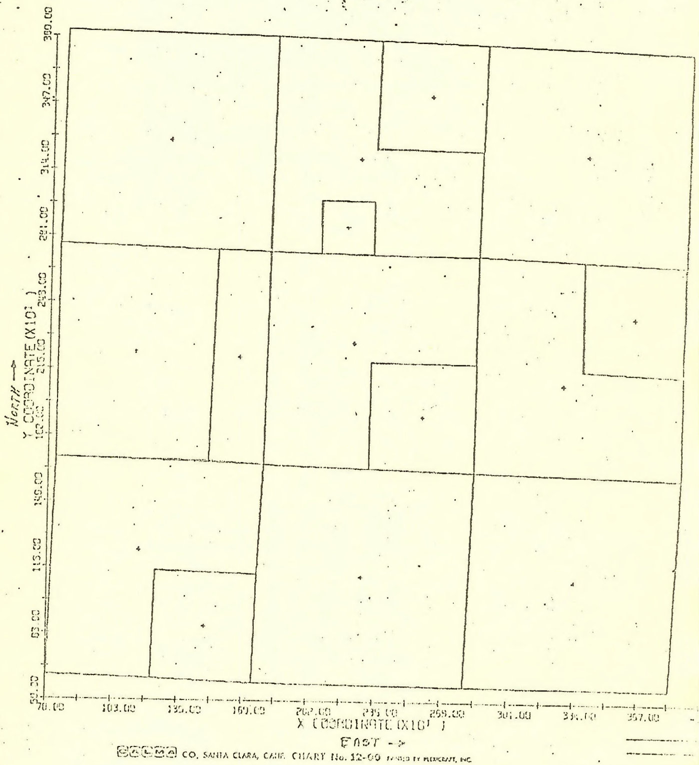
Site Class Birth date

```
|1|1 2|  1  | 3 |       8  9  |  ( 1)      |  ( 2)      |  ( 3)          |  ( 4)       |  ( 5)          |  ( 6)      |  ( 7)     |
DATA  SPEC     SUR.No  T.  R. R SEC.  GREEN VOL.    DEAD VOL.   RISK OR.VOL     TOTAL VOL.   MORT SILV. VOL   MORT. SILV.   ACRES
CLASS                                    MBF           MBF          MBF            MBF            MBF          PERCENT
S 1 0  1810   2 170 70423      455.00      142.50       161.50        598.50       307.70       51.41        19.00
S 1 D  1810  11 160 602 7      740.60        0.00         0.00        740.60         0.00        0.00        23.00
S 1 0  1810  19 160 602 7     8380.50      684.50       647.50       9065.00      1353.80       14.93       185.00
S 1 D  1810  25 180 80329    16443.00        0.00         0.00      16443.00         0.00        0.00       261.00

S 1 D  1810                  26020.10      827.00       809.00      26847.10      1661.50                   488.00

S 1 0  1870   4 170 70423     3644.00      300.00       272.00       3944.00       579.10       14.68        40.00
S 1 D  1870  51 160 70115     8195.00      132.00         0.00       8327.00       139.30        1.67       110.00

S 1 D  1870                  11839.00      432.00       272.00      12271.00       718.40                   150.00

S 1 D  1900  26 160 70218        0.00        0.00         0.00          0.00         0.00        0.00        20.00

S 1 D  1900                      0.00        0.00         0.00          0.00         0.00                    20.00

S 1 D  1950   9 160 602 7        0.00        0.00         0.00          0.00         0.00        0.00       116.00

S 1 D  1950                      0.00        0.00         0.00          0.00         0.00                   116.00

S 1 D  1960  13 160 602 7        0.00        0.00         0.00          0.00         0.00        0.00        98.00
S 1 D  1960   3 170 70423        0.00        0.00         0.00          0.00         0.00        0.00        39.00
S 1 D  1960  24 180 80329        0.00        0.00         0.00          0.00         0.00        0.00        28.00
S 1 D  1960  22 180 80329        0.00        0.00         0.00          0.00         0.00        0.00        78.00
S 1 D  1960  23 180 80329        0.00        0.00         0.00          0.00         0.00        0.00        78.00

S 1 D  1960                      0.00        0.00         0.00          0.00         0.00                   321.00

S 1 D  ****                  37859.10     1259.00      1081.00      39118.10      2379.90                  1095.00

S 1 ** ****                  37859.10     1259.00      1081.00      39118.10      2379.90                  1095.00

S 2 D  1810  34 190 80217     5625.20      196.80       229.60       5822.00       442.70        7.60       164.00
S 2 0  1810   5 190 802 5    28875.70      646.10         0.00      29521.80       666.50        2.26       497.00
S 2 D  1810  14 170 901 1     1291.50      157.50       119.00       1449.00       279.90       19.32        35.00
S 2 D  1810  19 170 901 1    10091.00     1013.80       876.80      11014.80      1924.80       17.47       274.00
S 2 D  1810   5 170 901 1     3126.60      453.60       429.30       3580.20       897.00       25.05        81.00
S 2 D  1810  20 170 901 2     2318.40      225.60       201.60       2544.00       434.30       17.07        48.00
S 2 D  1810  35 170 70329      188.80       14.40        16.80        203.20        32.30       15.90         8.00
S 2 D  1810  16 170 70111       89.60        0.00         0.00         89.60         0.00        0.00         7.00
S 2 D  1810  20 150 70627     1744.40      184.80        89.60       1929.20       276.40       14.33        28.00
S 2 D  1810  19 160 60319     2620.80      585.00       179.40       3205.80       775.70       24.20        78.00
S 2 D  1810  16 160 60111     3005.00      225.00       170.00       3230.00       399.90       12.38        50.00
```

Appendix 4, page 2

Part of a Printed Output from a Sort Summary Run of the Operations Area Inventory Data

A Computer Plot of a Quarter Township from the Land Status Model, NW 1/4, T. 15 S., R. 6 W.



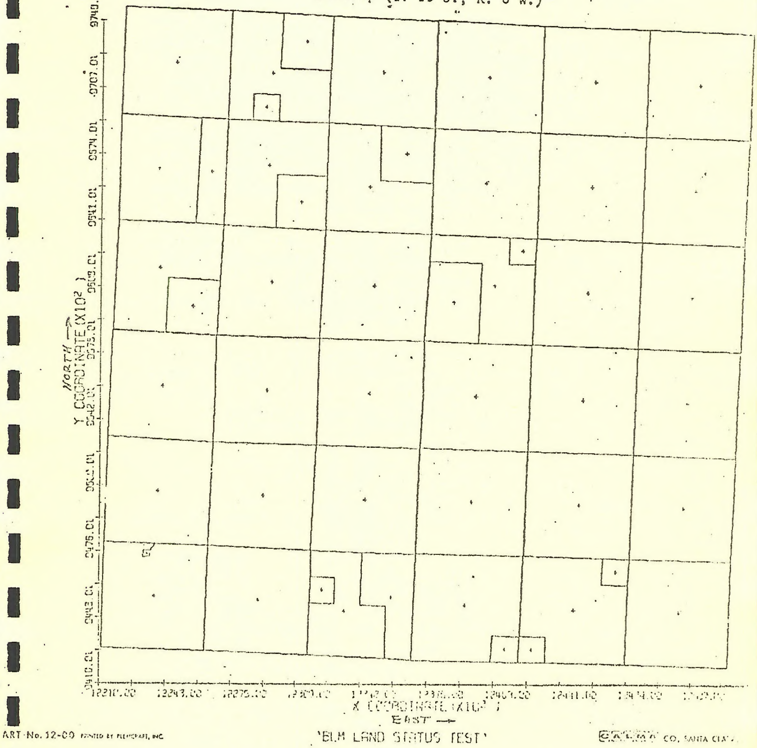
'LS' '3' '150' '060' '2'

File Identification No. 3 150 060 2

Appendix 5, page 1

Reduced Copy of a Computer Plot of a File from the Land Status Model

A Computer Plot of the Land Status Model for an Entire Township (T. 15 S., R. 6 W.)

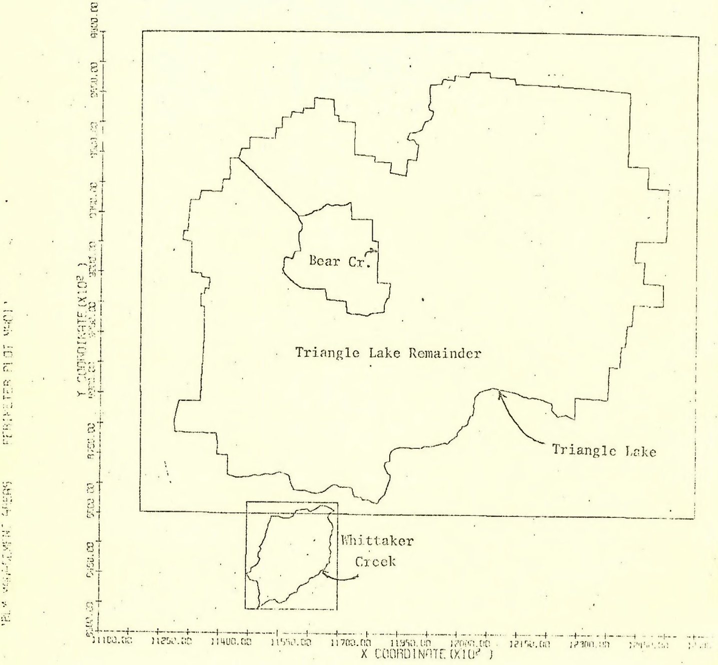


LS 3 150 060

T. 15 S., R. 6 W.

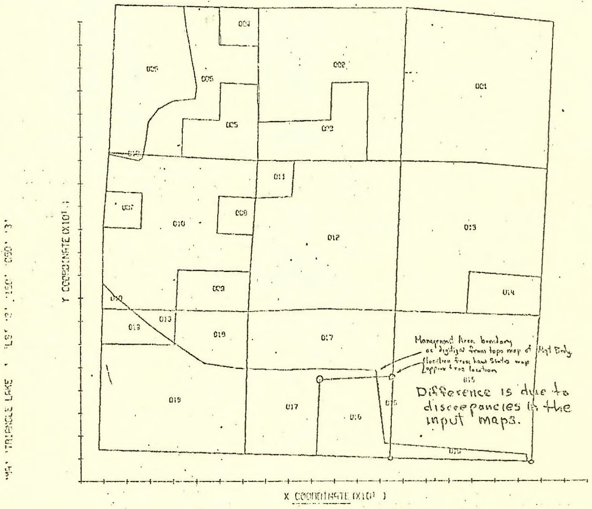
Appendix 5, page 2

Reduced Copy of a Computer Plot of Four Files (a township) from the Land Status Model



Appendix 5, page 3

Reduced Copy of a Computer Plot of the Management Area Model



Management Area boundary as digitized from topo map of Mgt Bndy.

location from Land Status map approx true location

Difference is due to discrepancies in the input maps.

Bear Creek Submgt. Area Boundary

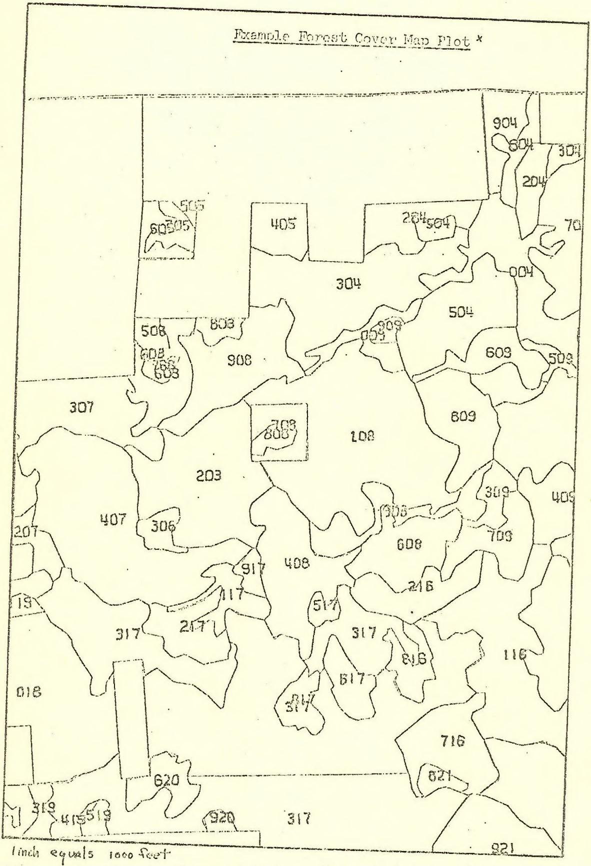
Model Combination: Management Area Boundary and Land Status

SW¼ of T. 16 S. R. 8 W.

Appendix 5, page 4

Reduced Copy of a Computer Plot of a Combination Model

(Management Area and Land Status)



Example Forest Cover Map Plot *

1 inch equals 1000 feet

* From Oregon Forestry Department Test of Map-Model

Appendix 5, page 5

Computer Plot (1" - 1000') of Vegetative Cover (Forest Type) Model

Example Forest Cover Tabulation *

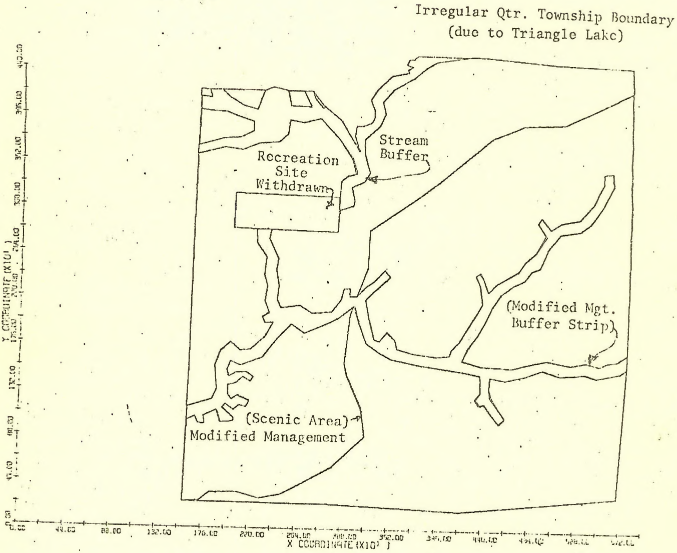
```
FILE IDENTIFICATION
FILE.TOWNSHIP='09S04E'  FILE.HALF='S'                    FILE.DESCRIPTION='COVER D

 /* FORESTRY DEPARTMENT COVER TYPE TEST - NOVEMBER 1969 */
 LEVEL_1 = STK_1;        LEVEL_2 = AGE;                 LEVEL_3 = SIZE_1;
 LEVEL_4 = SP1;                                         DETAIL_A = TYPNO;
 DETAIL_B = SP2;         DETAIL_C = SIZE_2;             DETAIL_D = STK_2;
 DETAIL_E = BIRTH_1;     DETAIL_F = CONTL;              DETAIL_G = SP3;
 DETAIL_H = SIZE_3;      DETAIL_I = SP4;                DETAIL_J = SIZE_4;
 /* TOTAL AREA IN ACRES */                              VALUE(1) = AREAPR(1,1);
 TOTAL_VALUES = 1;

    | 4 |3| 2 | 1 |  A  | B |C| D |  E |F| G |H| 1 |J|   ( 1)     |

      D  3 *** ***
                                                            583.32
      D  4     C20 06630          1870
                                                             12.63
      D  4     020
                                                             12.63
      D  4     ***
                                                             12.63
      D  4 *** ***
                                                             12.63
      D  5     020 04124  H  4 020 1700
      D  5     020 02524  H  4 020 1700                       41.31
      D  5     C20 01921               1750                    7.71
                                                              9.25
      D  5     020
                                                             58.29
      D  5     C40 C4726               1700
      D  5     040 01520               1750                   23.62
                                                             30.25
      D  5     040
                                                             53.87
      D  5     080 04024  H  4 020 1700
                                                             18.35
      D  5     080
                                                             18.35
      D  5     ***
                                                            130.52
      D  5 0   040 06330            1700 /  D  3 060          59.21

      D  5 0   040
                                                             59.21
      D  5 0   ***
                                                             59.21

      D  5 *** ***
                                                            189.73
```

Appendix 5, page 6

Sort Summary of Forest Type Model

(Retrieval instructions to computer
are at top of the page)

* From Oregon Forestry Department Test of Map-Model

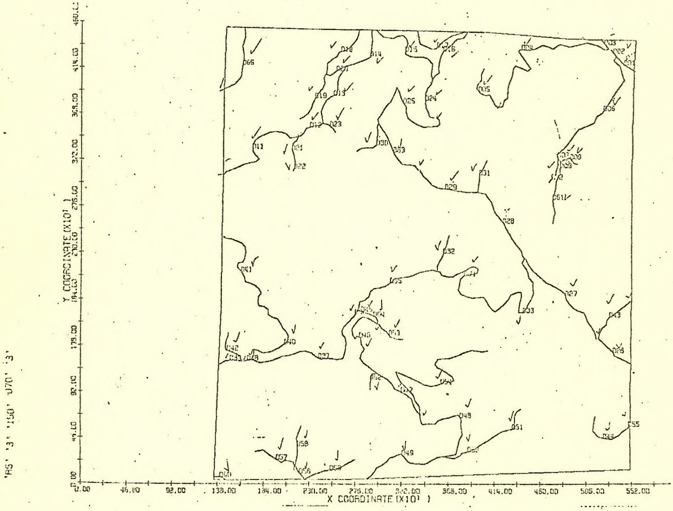


BLM Restricted Management Areas
SW¼, T. 16 S., R. 7 W.

Appendix 5, page 7

Reduced Copy of a Computer Plot of One File
of the BLM Restricted Management Model

(Degrees of Limitations on Timber Harvesting on BLM Lands)



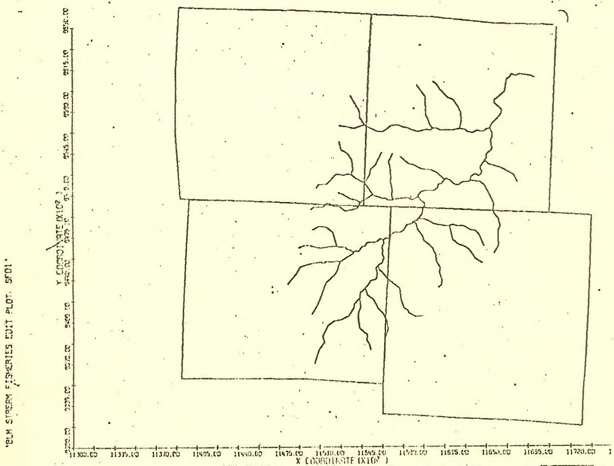
Road System - Plot for Visual Editing

Numbers are for Road Pieces in

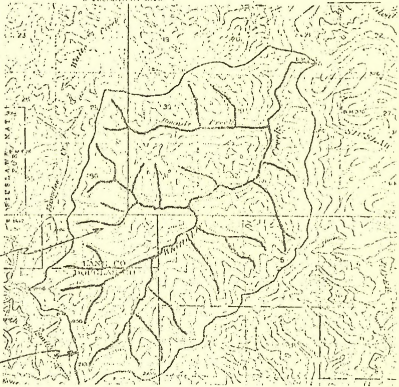
SW¼ T. 15 S., R. 7 W.

Appendix 5, page 8

Reduced Copy of a Computer Plot of One File of the Road System Model



Plot of Stream Fishery Model
SW¼ T. 18 S., R. 8 W.
SE¼ T. 18 S., R. 9 W.
NW¼ T. 19 S., R. 8 W.
NE¼ T. 19 S., R. 9 W.



Topographic Map of Whittaker Creek Drainage in the Map Above

Boundary of the Whittaker Creek Management Area

Appendix 5, page 9

Reduced Copy of a Four File Computer Plot of the Stream Fishery Model and the Same Streams on a Topographic Map

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